DETERMINING PRICES FOR RADIATA PINE CLEARWOOD

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ABSTRACT

Due to the widespread practise of pruning radiata pine trees in New Zealand there will be a substantial amount of timber free of knots to sell in the future. This timber is called "clearwood". A method is presented for determining what prices clearwood might fetch in any particular country/ market.

Part one outlines the history of pruning in New Zealand. The main reason for it is to achieve a larger profit through the higher prices paid for clearwood. Radiata pine clearwood is of comparable quality to selected clear softwood timbers from North America. Only its wide ring width is a significant disadvantage. Due to competition from within New Zealand, up to 75 to 85% of future clearwood production will be exported.

Part two presents timber prices in the USA for different grades of Douglas fir/larch, hemlock/fir, ponderosa pine and southern pines. Prices paid for select timber grades are rising disproportionately ahead of structural grades. However the reason for this trend and the length of time it will continue is difficult to ascertain.

Part three outlines the method. The price paid for a clear grade of an equivalent timber is used to predict a price for clearwood on that market. Applying this method to the USA market reveals that clearwood would be viewed as equivalent to select grades of Douglas fir/larch and hemlock/fir. Prices paid for these timbers indicate that around \$US280/m^3 could be paid for clearwood.

Part four applies the method to the markets of New Zealand, Australia and Japan. However, the lack of significant volumes of competing softwood timbers prevents this method being effective when applied to the New Zealand market. The method would be effective for the Japanese and Australian markets, but not enough is known about softwood timber prices in these countries to determine a price for clearwood in them.

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Determining prices for radiata pine clearwood

(or: "An exercise in obtaining conflicting timber price data and "mashing it about" until it has enough relevance to predict a price for radiata pine clearwood timber.")

GLOSSARY

CIF	:	Cost, Insurance and Freight
CNI	:	Central North Island
CPI	:	Consumer Price Index
FAO	:	Food and Agriculture Organisation
FAS	:	Free Alongside Ship
FOB	:	Free On Board
FRI	:	Forest Research Institute
MDF	:	Medium Density Fibreboard
NAFTA	:	New Zealand Australia Free Trade Association
NZFS	:	New Zealand Forest Service
NZTIF	:	New Zealand Timber Industry Federation
SILMOD	:	Silvicultural Stand Model
USA	:	United States of America
USDA	:	United States Department of Agriculture
WWPA	:	Western Wood Products Association

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INTRODUCTION

Within the New Zealand Forestry Industry there is a great deal of debate about the radiata pine clearwood question. This question can be simply defined as, "will radiata pine clearwood have markets both domestic and foreign that will pay premiums for the timber that justify the investment of pruning?". Asking this will produce a range of other questions, most with qualifications on the answer.

Within this range is a question on what prices are being paid on various markets for high quality timber grades of softwoods similar to radiata pine. Could these prices be used as an indication of likely premiums for radiata pine clearwood? An indirect method of predicting a future price for radiata pine clearwood is needed as no large quantities of it have been marketed anywhere yet.

In this paper sawn timber prices from the USA are investigated for their use in the development of a method of predicting prices for radiata pine clearwood. Sutton (1975) performed a similar exercise for coniferous logs with no firm conclusions made. This investigation of timber prices has been divided into four parts.

Part one provides a background to the investigation. Radiata pine clearwood is described and the history of, and the reasons for pruning radiata pine to produce clearwood are outlined. Radiata pine clearwood is then compared to selected softwood species that have a large share of the world trade of coniferous sawn timber. These are species that radiata pine clearwood will in future compete against and thus inevitably be compared with.

Part two presents some historical USA prices paid for selected locally grown (USA) timber species. Timber grades of these species that would be equivalent to New Zealand radiata pine grades of timber are singled out for investigation. Factors causing the historical fluctuations in the prices for these grades are discussed. A price ratio of finishing grades to other grades of timber is calculated to indicate the premium that is being paid for high quality timber on that market.

Part three presents a method which could be used to predict the price that radiata pine clearwood could receive on a specific market. Information on timber prices from part two is used as an example of how this method would be applied to the USA market.

Part four then applies this method to the domestic timber market and potential foreign radiata pine clearwood markets. This is to determine the effectiveness of the method and what extra information is needed about any market for it to be applied.

Limitations of the investigation

There are a number of studies on the potential of exports of New Zealand forest products to overseas markets. Some of these for example are Sutton (1975), Ashenden (1979) and Coppens (1980). This study differs in that it concentrates on prices that could be paid in future for radiata pine clearwood on various markets. The bulk of the investigation has been devoted to the development of a method that could be used to predict (not forecast which implies a longer period of time) prices for radiata pine clearwood in any country for the next 2 to 3 years (markets and countries are almost synonymous terms within the confines of this paper). Beyond this period the predicted prices will be inaccurate due to the changing nature of markets. However the method can forecast or pinpoint promising markets for radiata pine clearwood. The short term predictions of prices are useful in that while factory grades of radiata pine are being produced and sold at present, no clear grades are to any degree. Therefore the method will at the present time isolate promising markets for radiata pine clearwood and if applied to each market 2 to 3 years before large sales are made, a price prediction can be made.

The method used for predicting the prices is outlined in part three. No mathematical equations or models are used. Emphasis is mainly on a combination of subjective and objective observations of the market in question. Markets are defined as selected countries that New Zealand has exported radiata pine sawn timber to in the past. The method relies on what the market's judgement is of radiata pine timber. This is used to select a softwood timber that the market would view as equivelent to radiata pine. The price being paid for quality grades of the equivalent timber is then used to predict a radiata pine clearwood price.

Access to information has been restricted, as has been the time of investigation. Most of the studies mentioned above have had 1 to 2 years devoted almost entirely to them, with long periods overseas in the market in question. Contrasted with this study, the investigation of any foreign market will be limited. However this will not alter the method of price prediction presented. To counter any lack of depth of investigation, personal communication with "experienced" people in the timber industry has been used and acknowledged where appropriate.

PART ONE

As stated in the introduction this part is meant as a background to the whole study. In places the information presented will seem disjointed and random. However its overall aim is to define radiata pine clearwood and to assess the standard of it compared with overseas timbers. West Coast North America timber species are mainly selected for comparison as they dominate the Pacific Basin timber trade and the timber market in Japan in particular (FAO, 1983). This part relies heavily on the work of W.J.R. Sutton, a scientist at the FRI in Rotorua. This is due to his 1975 thesis containing much information of relevance to this paper.

1.1 Clearwood

Clearwood can be defined as wood that has minimum grain distortion. This wood occurs naturally between the branches or nodes of a tree. Within the confines of this paper though, clearwood is that timber sawn from outside of the knotty core (occlusion zone) of an artificially or naturally pruned log. Some grain distortion and defects could be present due to resin pockets, adventitious shoots and other defects. Factory or shop grades are defined as timber cut from the internodal region of a log. Factory and clearwood grades together comprise the grouping of finishing or dressing grades. Other grades are referred to as standard, common, structural etc.

The term clearwood is misused often in the New Zealand forestry industry. For example the "Forest Industry

Study" (1980) refers to "clearwood markets" and Sutton (1975) refers to "clear sawn timber". This would indicate that for all softwood species, wood free of knots is viewed as being homogeneous and perfectly substitutible. Most overseas markets though will pay different prices for different species of finishing grades. Also there is a difference in the price paid for factory and clearwood grades of the same species. This is shown clearly for the USA in part two. So in this paper the species name and the type of finishing grade are always used to define the timber grade being referred to. To make things easier though the term "clearwood" will be used to mean "radiata pine clearwood" unless specially stated otherwise.

Whiteside (1982) has developed clearwood grades that the FRI is using at present for grade outturn evaluation of pruned buttlogs. These are modelled on the North American Western Wood Products Association's C and D select grades. These have been used to produce radiata pine number 1 and 2 clear grades and a number 1 cutting grade. Small allowances have been made for specific defects of radiata pine.

1.2 Reasons for the production of clearwood

As with some investments of the New Zealand government and most investments by private enterprises, the main reason for pruning is profit. By pruning a radiata pine tree to produce clearwood, the assumption is that there will be a higher price or premium paid for the improved quality wood (quality measured in terms of strength and appearance). This premium will enable a good rate of return on investment to be made. The New Zealand treasury stipulates a 10% rate of return on government forestry investments (Fraser et al., 1977). Whiteside (1982) used a price of between \$202 and \$248 per m^3 of clearwood for his investigation of the gross value before sawing of a log. This is an indication of a price range that growers are expecting on the domestic market.

Other reasons for pruning radiata pine in New Zealand (most are profit oriented to some degree) are outlined below.

(i) Increasing the diameter growth of radiata pine through combinations of fertilizing, reduced stocking and planting on better quality sites also had the effect of increased branch diameter growth. This results on the production of large volumes of wood with large bark enclosed knots. Pruning off the lower branches of the best formed and fastest growing trees will partly solve this dilemma.

(ii) Radiata pine structural grades, even with small tight knots are equivalent only to the poorest grades of major foreign softwoods (Appendix 3 has an outline and description of selected USA softwood timbers). Clearwood though is comparable to some of the best finishing grades of the same softwoods (Sutton, 1975).

(iii) In some regions (eg. the Canterbury Plains), pruning as well as for the production of clearwood is carried out as a fire and windthrow protection measure.

(iv) Often pruning is used as a job creation scheme in economically depressed areas like Aupouri and Mangatu (DFC, 1980).

(v) Other miscellaneous reasons are improved access into a stand, improved visual appearance on roadsides and improved stand health by opening it up.

1.3 Other radiata pine finishing grades

"In the absence of a self pruning habit by radiata pine, quality (ie. clear or near clear) finishing timber can only be achieved by pruning or by the utilization of the long clear internodes of trees tending to an uninodal branching habit" (Sutton, 1975).

Fingerjointing of these clears can produce long lengths of clear timber of a high quality. In such furniture uses as drawer sides and carcasses in furniture making, where appearance is not critical, finger jointing is completely acceptable. Fingerjointing of several clears to make products like facia boards will lower the overall distortion of the board. This is achieved by the individual pieces of the fingerjointed board tending to twist in different directions. This reduces the distortion of each piece and thus reduces the distortion of the whole board, which raises its quallity (J.C.F. Walker, pers.comm.).

Competition from fingerjointed and factory grade boards will be a factor in determining the price paid for clearwood. For decorative uses, clearwood should fetch a high price due to higher quality. This price should not be so high though as to cause large scale substitution of clearwood by other finishing grade boards. Clearwood prices in New Zealand will be set by the New Zealand Timber Industry Federation and this factor should be taken into account.

1.4 The history of radiata pine silviculture in New Zealand

As no special investigations have been performed by the author, this history is a summary of various publications. For silvicultural history Sutton (1981 and 1984) are recommended for further reading, while Poole (1969) and Allsop (1973) give an overall view of New Zealand forestry history with some bias towards the role of the NZFS.

The first large scale plantings of radiata pine were in the period 1925 to 1935 when some 350,000 ha were established. Although there was much debate on thinning and pruning this resource not much of either was performed. Competition grew so intense in the stands that in the late 1940s and early 1950s the *Sirex noctilo* wood wasp built up to epidemic proportions and attacked and killed the lower-dominance trees. This provided the stands with a much needed thinning.

The works of the South African Craib (1939) and the Australian Jacobs (1938) on pruning, had by the mid 1940s influenced thinking in New Zealand enough for green crown pruning to be considered. A back log of planting and lack of finance meant that what pruning that was performed was too late and generally not accompanied by a thinning.

The first crop harvested quantities of knotty radiata pine were not received well by sawmillers and the public which were both accustomed to high quality indigenous sawn timber. This helped foster thinking on the possible benefits of pruning. However it is difficult to pin the initial reasons for pruning down to a few causes. It would be fairer to say that the acceptance of it as a practise just slowly developed with a lot of contributing causes.

The first major attempt to develop a tending schedule for radiata pine in New Zealand was that of Ure (1949) for natural regeneration stands in Kaingaroa Forest. Pruning was performed to 6.1 m along with two thinnings to waste and two extraction thinnings. This regime was later modified to include only one extraction thinning. However the regime proved a failure due to high costs and low returns associated with any production thinning.

In the late 1950s and early 1960s the amount of new area planted and area pruned started to increase. Appendix 1 shows the areas pruned and thinned in the past. It is this increase in planting and tending that led to the term old, transition and new crops.

With the increasing interest in silviculture the FRI started to develop yield prediction models and regimes for intense management of radiata pine. Beekhuis's (1966) variable stand-density yield model made it possible for a range of initial spacing and thinning options to be compared. The first proposal for an alternative regime was that of Fenton and Sutton in 1968 (see Appendix 1). This regime had a final crop stocking of 200 stems/ha which were all pruned to 11.0 m. Unselected trees were eliminated as early as possible to lower the competition for the pruned trees.

In the 1970s the areas pruned continued to increase as did the number of different regimes for tending. Williams (1981) shows that there were 67 regimes being practised in 1979 as opposed to 26 regimes in 1970. See Appendix 1 for a table of the 1979 regimes. The chief area of variation was the final crop stocking. The main reason for this large variation being due to forest managers' adaptions of initially similar intensive tending regimes to fit special site conditions and processing options.

Concern about the proliferation of regimes led to the formation in 1979 of the Radiata Pine Task Force to bring together all work relevant to the growing processing and marketing of radiata pine in New Zealand.

The major product of this team has been the silvicultural growth model SILMOD. This model can be used to evaluate the effects that decisions on silviculture and processing will have on the produce of the average hectare of a forest stand. A finding of the task force's was the poor timing of past pruning operations. This was not a surprising discovery as past regimes were not based on much scientific evidence. Work on how the diameter over stubb determines the size of the defect core by Park (1982) made it possible though to discover just how miss-timed past operations were.

Making SILMOD and other information on silvicultural practises available to the forestry industry is hoped to lead to rationalization of tending schedules. Site variation still exists throughout New Zealand, as do different end markets. As long as these exist the variation in regimes will continue. Some regimes however will be changed (rationalized) to optimize produce as a result of FRI work.

1.5 The amount of clearwood available for export

The following calculation is performed to gain a "rough" estimate of how much excess (above New Zealand consumption) clearwood will be available for export in the future. The forest owner of the future timber surplus is not a consideration. It is assumed that all production of clearwood will first be offered to the domestic market and once this is satisfied the excess will be exported.

(i) Expected domestic use of clearwood

First it is necessary to gain an estimate of the sources of New Zealand's past (specifically from mid 1970s to the 1980s) consumption of softwood finishing grades. This has been from a number of sources:

- Fingerjointed and factory grades of radiata pine
- Clear or near clear lengths of indigenous timber
- Imported high quality timber
- Recent small volumes of clearwood.

These sources of clear timber would have comprised around 12-20% of the New Zealand sawn timber consumption (N. Clifton, pers.comm.).

The substitution of these timbers by clearwood is difficult to determine. Appendix 2 shows that the fourth medium density fibreboard (MDF) plant is now being planned for the Nelson area. With other plants operating or planned for operation at Rangiora (Canterbury Timber Products Ltd), Taupo (Fletchers) and Auckland (Carter Holt), in the future large volumes of this panel will be available to the New Zealand domestic market.

Uses such as window fitting and door surrounds have largely been filled by rimu and other indigenous timbers in the past. For these and other uses which are demanding on the workability of a product, this panel will be very acceptable (see Appendix 2).

The time when large supplies of MDF will be available is also important. The supplies of indigenous timber should be decreasing in the future. The recently elected Labour party is moving towards stopping all indigenous harvesting in the Central North Island (CNI). See Appendix 2 for a recent newspaper article. A reduced supply of indigenous timber from Westland is also expected once local radiata pine plantations mature. This would lead to the conclusion that the ever decreasing national harvest of indigenous timber will decline at a greater rate in the future. With this decreasing supply of indigenous timber it is likely that MDF could be the substitute. This substitution could capture the market before clearwood is harvested in significant quantities in the mid 1990s.

The importation of North American softwoods should continue at its present level. There should always be a certain "timber conscious" part of the market that will demand this type of timber if available for import.

(ii) Amount of clearwood available

The amount of clearwood expected to be produced in the future is shown in Table 1.

Table 1: Future production of clearwood (annual averages).

Year	Pruned logs 35 cm+ s.e.d. (000 m^3)	Proportion of clear timber in sawn output (%)	Sawmill conversion rates (%)	Total clearwood available (000 m^3)
1981-85	261	29	50	37.8
1986-90	380	29	52	57.3
1991-95	1198	29	53	184.1
1996-00	2335	29	55	372.4
2001-05	3961	50	56	1109.1
2006-10	4636	50	56	1298.1
2010-15	5576	50	56	1561.1

Source: Whiteside (1984), Forest Processing Group (1981).

These figures are calculated using the volumes and grade out-turn of pruned buttlogs harvested in the future as given by Whiteside (1984). Future national average sawmill conversion rates were also calculated. The work party on exotic forests processing options (1981), devised the following scenario. Existing average mill conversion rates were assumed to be 45%. New sawmills planned for establishment from 1996 to 2000 would have an average conversion rate of 55%. As pruned buttlogs are larger than the average log, conversion rates for these logs in the new and existing sawmills were assumed to be 5% greater. This scenario was then used to calculate the average sawmill conversion rates for the future industry shown in Table 1. All three sets of figures were then muiltiplied to produce the future volume of clearwood forecast. These clears are those defined as number 1 and 2 clears by Whiteside (1982).

(iii) Domestic consumption of clearwood

Assuming that MDF does capture a large share of the indigenous clear sawn timber market by 1990, then it is probable that a large proportion of clearwood produced will be exported. Total apparent consumption of sawn timber in 1983 was 1,645,000 m^3 (NZFS, 1984). If 15% of this was finishing grade timber, the volume would be approximately 247,000 m^3. The population and therefore the sawn timber consumption should rise in the future. A rough estimate of a consumption of around 300,000 m^3 of clear sawn timber by 1990 could be expected.

A talk with Norm Clifton of the NZFS revealed the difficulties in determining how much of this will be clearwood consumption. It is likely however that as much as 75 to 85% of clearwood produced could be exported. After 1996 the amount of clearwood produced is likely to be greater than the total consumption of clear sawn timber in New Zealand. So a range of export volumes from around 279,000 m^3 in 1996, rising to 1,327,000 m^3 in 2015 indicates the possible size of the exports of clearwood.

These figures are only to be used in parts 3 and 4 to show that some large overseas markets could if desired buy all of this excess. Therefore a reformed calculation to reduce any error would only be academic and not be reflected in any conclusions made in this paper.

1.6 Finishing grades of competitive timbers

Most of New Zealand's expected competition for clearwood is from the large softwood exporting countries of the USA and Canada. Therefore it is with their domestic species that clearwood is often compared. Competitive timber species can be narrowed down to those occurring predominantly on the West Cost of these countries. It is from this region that most competition in Pacific rimu markets is likely to arise.

Sutton (1975) compared radiata pine clearwood and structural grades to equivalent grades of southern pines, ponderosa pine, scots pine, Douglas fir and Norway spruce. Finishing grade comparisons were based on strength values. Structural grade comparisons were only performed on the different specifications and defects allowed for each grade. Conclusions were that radiata pine clearwood in terms of basic strength is comparable to all of the above timbers. Surface hardness of radiata pine (often thought to be a limiting factor) was only lower than that of loblolly pine and Douglas fir. Structural grades of radiata pine were only equivalent to the poorest grades of the other species.

Outlined below is a comparison of other characteristics of clearwood with the finishing grades of competitive West Coast North American species.

(i) <u>Ring width</u>

The short rotation length planned for intensively tended radiata pine promotes fast growth through heavy early thinning of unselected trees. The clearwood produced will as a result have large ring widths. These could be as high as 8 to 15 mm between each ring (Sutton, 1975).

West Coast North American timber harvested in the past has mainly been from old growth stands. The average age of trees harvested will vary with each species. Trees harvested above the age of 150 years though can be expected to have clear grades of wood with very narrow growth rings.

In almost no market is a wide ring width viewed as an advantage (D. Smyth, pers.comm.). In some markets wide ring widths are seen as an indication of low strength and thus low quality. This is why the New Zealand Forest Service has been using stress grading in Japan to promote New Zealand grown radiata pine structural grades.

(ii) Colour

Radiata pine sapwood is a light cream to brown colour. Comparison of the value of this with competitive species is difficult, as the colour preference of a market is dictated by fashion which changes often.

(iii) Working Properties

Radiata pine machines and nails well, is moderately strong and has good glueing and painting properties (NZFS, 1983). Comparison of this property is difficult due to the variability of it between competitive species. Overall clearwood should compare favourably, especially with its medium density reducing the frequency of splitting during nailing. This medium density does to a certain extent disadvantage it in exacting uses like table tops though.

(iv) Durability

The natural durability of radiata pine wood is low, but it can be readily treated with preservatives. This however should not be needed for clearwood as it would be most often used in interior higher quality uses. These would generally be a lower decay risk than experienced by exposed timbers.

(v) Dimension of timber produced

Because New Zealand can grow large diameter radiata pine logs it thus has the ability to saw large dimensional timber from them (Sutton, 1975). The production from the old growth stands in West Coast North America is to diminish in the future, with increasing volumes being produced from second growth stands (USDA, 1982). These will be younger in age and of a smaller average diameter. The amount of large dimension timber produced will then diminish in the future. This should be an advantage when marketing clearwood.

PART TWO

This part presents historical prices paid for softwood timber in the USA. It is this information that will be used in part three for a prediction of the price clearwood would receive on the American market. The information and analysis may seem random here, but it is what is partly sufficient for the method to work.

All references to a country or market in part two refer to the USA unless stated otherwise.

2.1 Timber prices

Timber prices from the Western Wood Products Association (WWPA) were used. This is a North West USA based association, comprised of the coastal states of Washington, Oregon and Northern California. Also included is the Rocky Mountain region of Montana, Idaho and Nevada. Prices F.O.B. the sawmill are published monthly and are gained through the submission of monthly invoices from all sawmills in the region.

Timber prices for the southern pines are also used. These are from data gathered by the Random Lengths Association. This is a nation wide timber price gathering and publishing organisation. The southern pines, described in Appendix 3, grow principally in the states of Florida, Alabama, South and North Carolina, Louisianna, Tenessee and Arkansas.

The reasons for choosing timber prices from the USA and these regions in particular for analysis, are outlined below.

(i) Potential market

The price that could be paid for clearwood in the USA is important because it could become a large market for radiata pine of this grade. Coppens (1980) stated that clearwood could be seen as a substitute for the less available tropical hardwoods traditionally used in furniture manufacture. There is a large furniture market in Los Angeles/Southern California where an estimated 25-30% of the furniture manufacturers use pine. As no finishing grade resources of pines are available locally, radiata pine clearwood could be imported.

Coppens' conclusion on the potential of the West Coast as a market was:

> "The changing location of West Coast processing facilities and distribution of forest resources, together with the introduction of new domestic and imported species, offer considerable potential for New Zealand componentry exports, as manufacturers are forced to replace or, at least, re-examine their existing supplies. The nature of New Zealand plantation forestry is widely known and reported in forestry circles, and the constant and increasing supplies of homogeneous material is likely to be very attractive to West Coast manufacturers used to changing species of variable quality. The fact that similar plantations exist elsewhere gives the importer a measure of security."

(ii) Free market determination of prices

Timber prices in the USA are not recommended by any central organisation. The USA organisations mentioned above only collect and publish timber prices and do not regulate them. Changing prices with changing market demand should show which species and grade of timber is the most valued at any point in time.

(iii) Availability of information

This is not meant as a comment on the timber industry in New Zealand, but it is much easier to obtain information on the USA timber industry than the New Zealand equivalent. Organisations like Random Lengths publish monthly timber grade prices as well as a weekly analysis of the national timber market. New Zealand has no similar organisation for information distribution. Any New Zealand annual timber prices given for sawn timber in NZFS statistics are not divided into prices paid for different grades. New Zealand sawmills will provide wholesale prices for grades of timber on request, but most do not keep records of historic prices. This is just describing the situation though, and suggested changes are outlined in part four.

(iv) Similarity of timber

Because radiata pine is a native of the West Coast of the USA, it can be expected that other tree species growing locally will have similar wood properties. This is not wholly true, but as is outlined in part one, radiata pine is comparable in wood properties to some of the native timbers.

The southern pines were also chosen because they are among the fastest growing timber species in the USA. This timber group is viewed as one of the lowest quality timber mixes in the USA (Govett and Sinclair, 1984). These should then fetch lower prices, which will allow a full range of the market's timber prices to be seen.

(v) Similar uses of wood

Americans consume large volumes of wood per capita (USDA, 1982), as do New Zealanders (MacGregor, 1970). Because both countries use most of the local production of timber in house construction it is probable that the quality of timber is judged in the same way in both countries. This will mean that a finishing grade timber favoured in the USA, could also be favoured in New Zealand.

2.2 Conversion of prices

As mentioned both of the USA sources of timber price data have monthly prices published. These figures were averaged to provide an annual price for timber grades from 1972 to 1983. The prices for both sources were initially \$US/1000 board feet. These were converted to \$US/m^3 as this is the volume unit most often used for timber in New Zealand. The use of American and not New Zealand's currency is because converting the prices to \$NZ would have no meaning for wood grown and sold in the USA.

The use of average annual prices will not show all the market trends as prices can often change by 20% or more between months. Annual prices will however show overall trends in the market, which is sufficient for the purposes of this investigation.

2.3 Timber grades chosen

(i) Species

As shown in Appendix 3 similar species of softwood timber in the USA are often marketed under one species name, or as a mix of species. Prices are not differentiated for species within any mix. This is similar to corsican pine sometimes being sold as radiata pine within New Zealand (NZFS, 1983).

The species and species mix chosen for analysis are Douglas fir/larch, ponderosa pine and hemlock/fir from the WWPA. These should cover all similar species to radiata pine that it will have to compete against from the association's listed species.

(ii) Grades

In order to reduce the difficulty of graphing and analysing the prices for all grades of the above timber mixes, only one or two grades have been selected from the following four divisions.

- Select and Finish

  These are the most valuable grades, which provide an excellent surface for all high quality end uses.

- Factory or Shop

  Timber that is intended for remanufacturing into various interior items.

- Boards

  These are knoty grades for general purpose use.

- Dimension

  This is a mix of grades encompassing different sizes and end uses.

Grades chosen in each grouping for each species, were those that would be similar to New Zealand radiata pine grades (NZS 3631). The grades chosen are shown in Appendix 5 with the reason for each grades' choice. Appendix 4 shows the WWPA grades for Douglas fir as summarized by Sutton (1975) and the NZS 3631 timber standards.

2.4 Prices

The prices for the timber grades are shown in Figures 1, 2, 3 and 4.

The dominant influence on the prices is domestic timber demand, which is primarily a derived demand; ie. arising from such influences as interest rates, family formation trends and internal socio-economic policies (L. Heenan, pers.comm.). Thirty-eight percent of the timber produced in 1976 was used in new housing construction (USDA, 1982). It is the increase in housing starts during 1976 to 1979 (Figure 5) that would account for the peaking of finishing grade prices in 1979. Apart from this it is difficult to determine any single factor causing overall price fluctuations.

2.5 Grade price changes

This whole investigation had its beginning in a suggestion from W.J.R. Sutton that the increasing price paid for finishing grades in this market be studied. Or more importantly to analyse the increasing ratio of prices for these grades as compared with those for lower quality board and structural grades.

This ratio can be calculated by dividing the price in a certain year for a select grade (or a board of equivalent high quality) by the price in the same year for a No.3 common board. The resulting figure can be called the

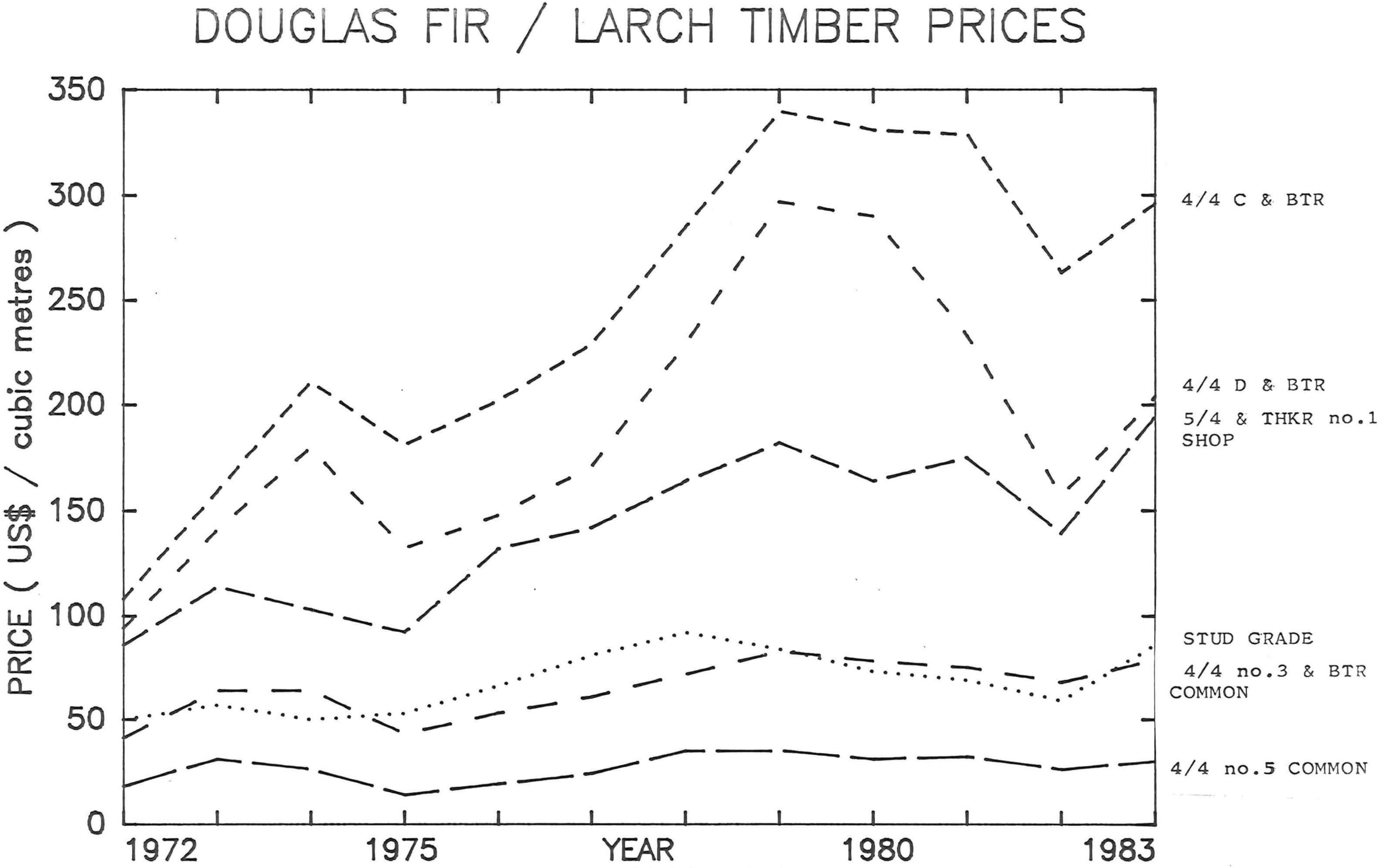

DOUGLAS FIR / LARCH TIMBER PRICES
PRICE (US$ / cubic metres)
0
50
100
150
200
250
300
350
1972
1975
YEAR
1980
1983
4/4 C & BTR
4/4 D & BTR
5/4 & THKR no.1
SHOP
STUD GRADE
4/4 no.3 & BTR
COMMON
4/4 no.5 COMMON

Figure: 1

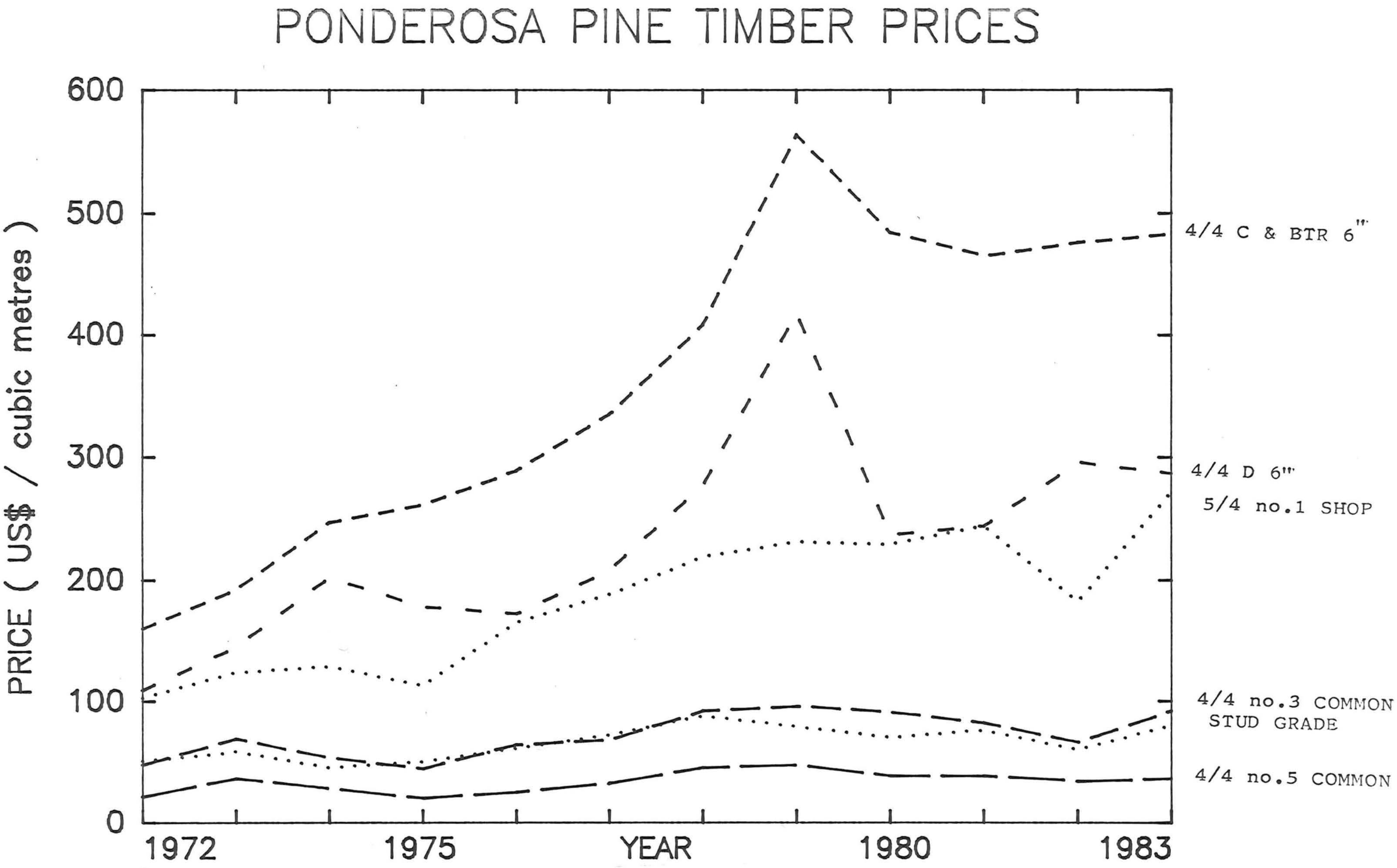

PONDEROSA PINE TIMBER PRICES
PRICE (US$ / cubic metres)
600
500
400
300
200
100
0
1972
1975
YEAR
1980
1983
4/4 C & BTR 6"
4/4 D 6"
5/4 no.1 SHOP
4/4 no.3 COMMON
STUD GRADE
4/4 no.5 COMMON

Figure: 2

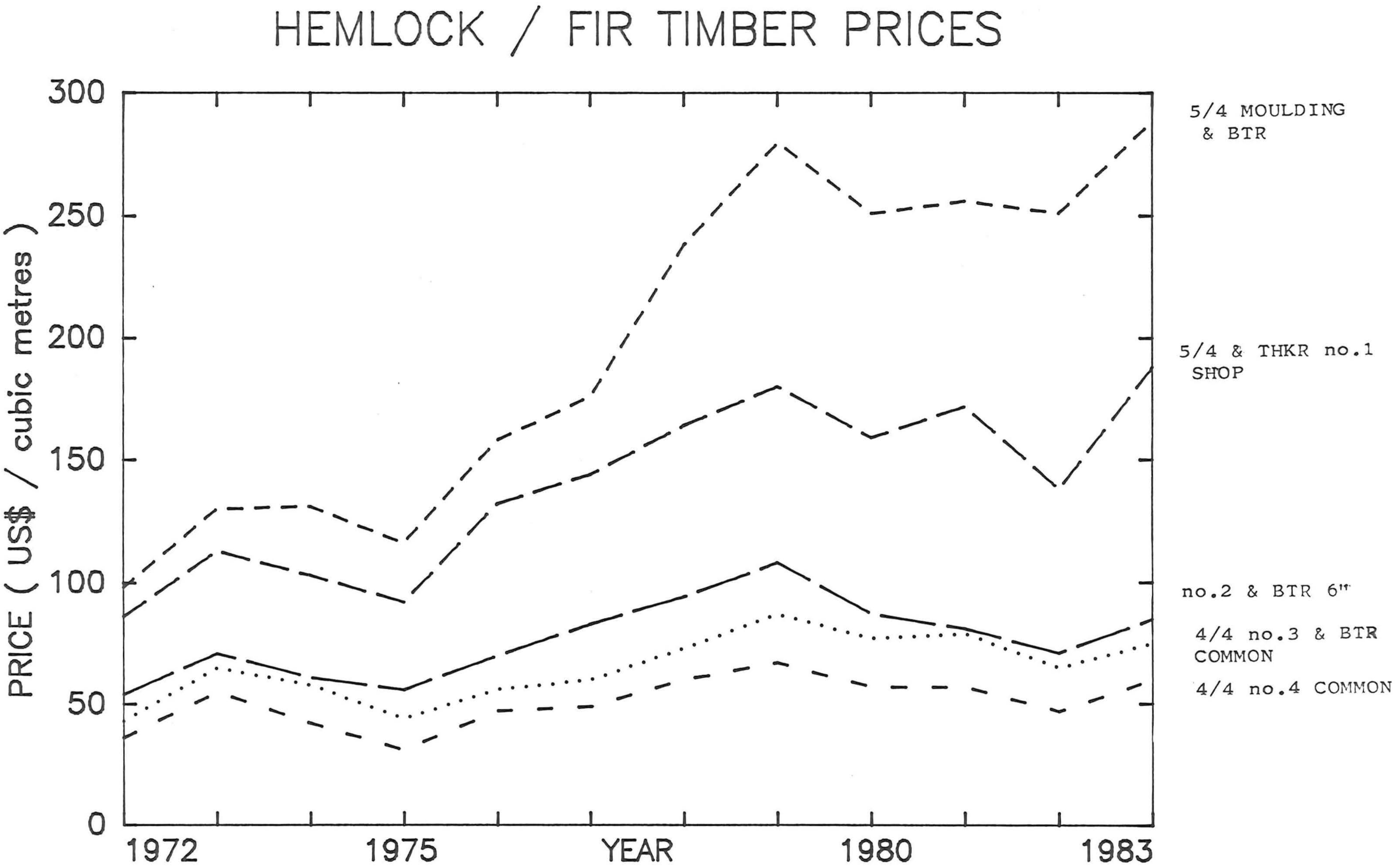
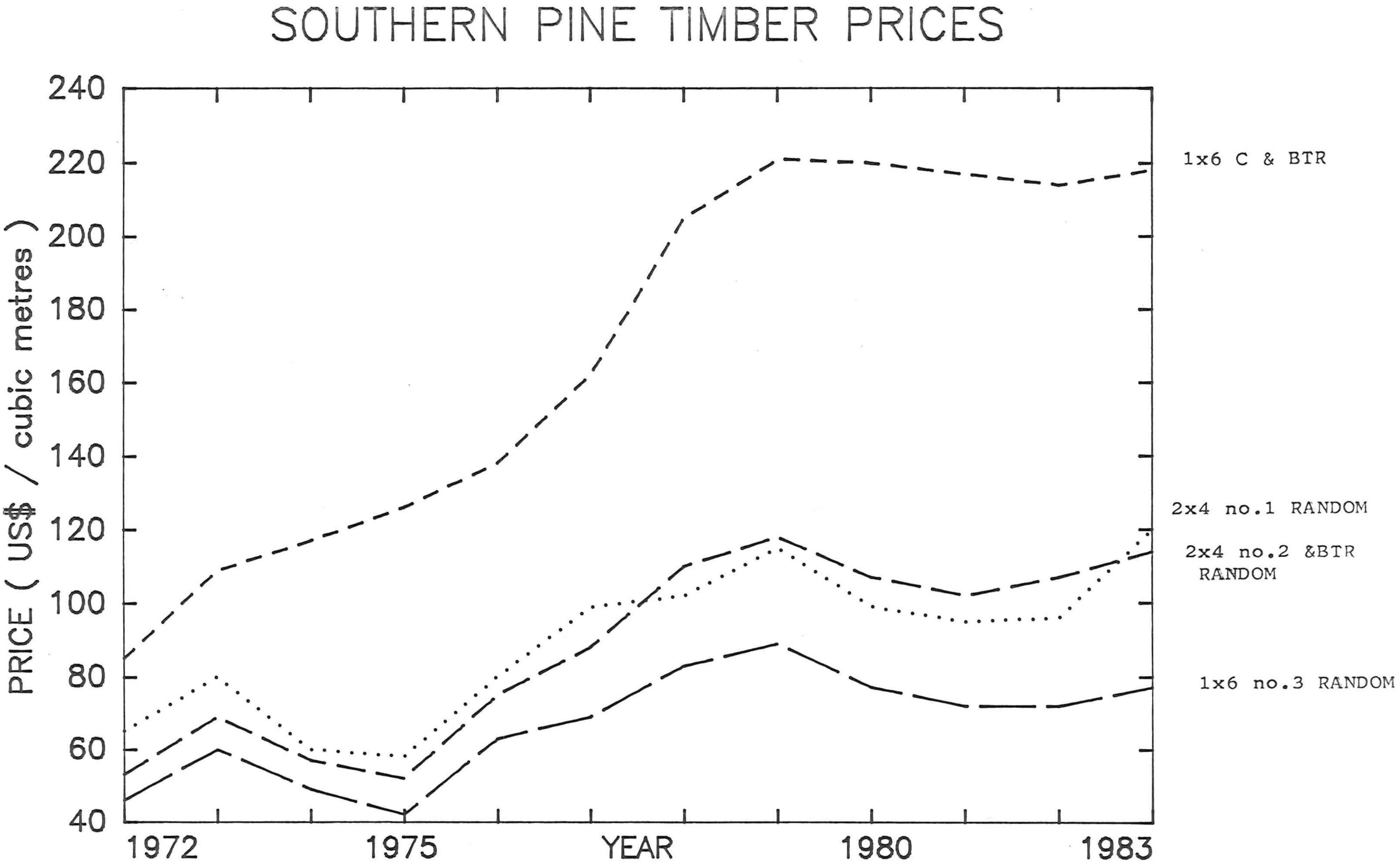

HEMLOCK / FIR TIMBER PRICES
PRICE (US$ / cubic metres)
300
250
200
150
100
50
0
1972
1975
YEAR
1980
1983
5/4 MOULDING & BTR
5/4 & THKR no.1 SHOP
no.2 & BTR 6"
4/4 no.3 & BTR COMMON
4/4 no.4 COMMON

Figure: 3

Figure: 4


SOUTHERN PINE TIMBER PRICES
PRICE (US$ / cubic metres)
240
220
200
180
160
140
120
100
80
60
40
1972
1975
YEAR
1980
1983
1x6 C & BTR
2x4 no.1 RANDOM
2x4 no.2 &BTR RANDOM
1x6 no.3 RANDOM

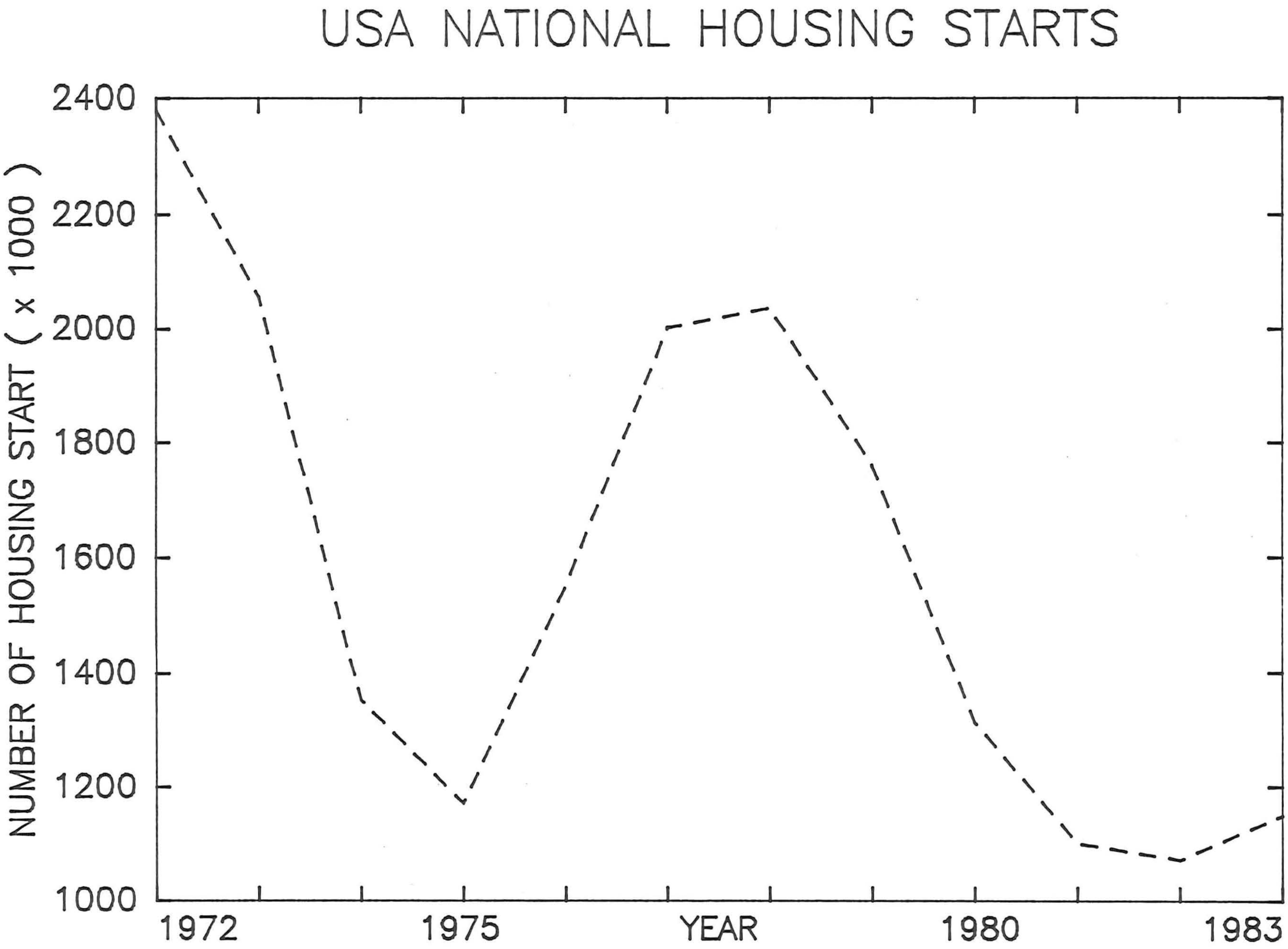

USA NATIONAL HOUSING STARTS
NUMBER OF HOUSING START (x 1000)
2400
2200
2000
1800
1600
1400
1200
1000
1972
1975
YEAR
1980
1983

Figure: 5

"quality ratio". It effectively shows how much more a select or high quality grade is valued than a common board. This calculation was performed for all the timber mixes with the results shown in Figure 6.

Clearly shown is how this quality ratio has risen for all the timber mixes studied. A simple conclusion that could be drawn from this, is that the USA market is increasingly paying a greater relative price for finishing grades over common grades. There are fluctuations in this trend, but on the whole the trend is upwards. This is an easy conclusion to make, but further evaluation of other possible causes is necessary.

(i) Inflation

Figure 6a shows the Consumer Price Index for all items sold in the USA with the index at 1972 = 100. Also shown in the index for some grouping of timber sold on the USA market. Both of these sets of figures are from the "Statistical Abstract of the USA 1984".

Analysis of all these figures shows the following. Overall the softwood timber index is lower than the CPI for all items, as is the index for southern pine and Douglas fir. Fluctuations within this though prevent any significant obervations being made.

An index of each grade of timber chosen above with the price in 1972 = 100 are in figures in Appendix 5. The index of these segregated grades shows how the finishing grades are rising ahead of the lower grades and the CPI of all items. It is interesting to note the general lowness of the index for the lower quality grades. In 1982, for most

PRICE OF SELECT / PRICE OF 3 COMMON GRADE

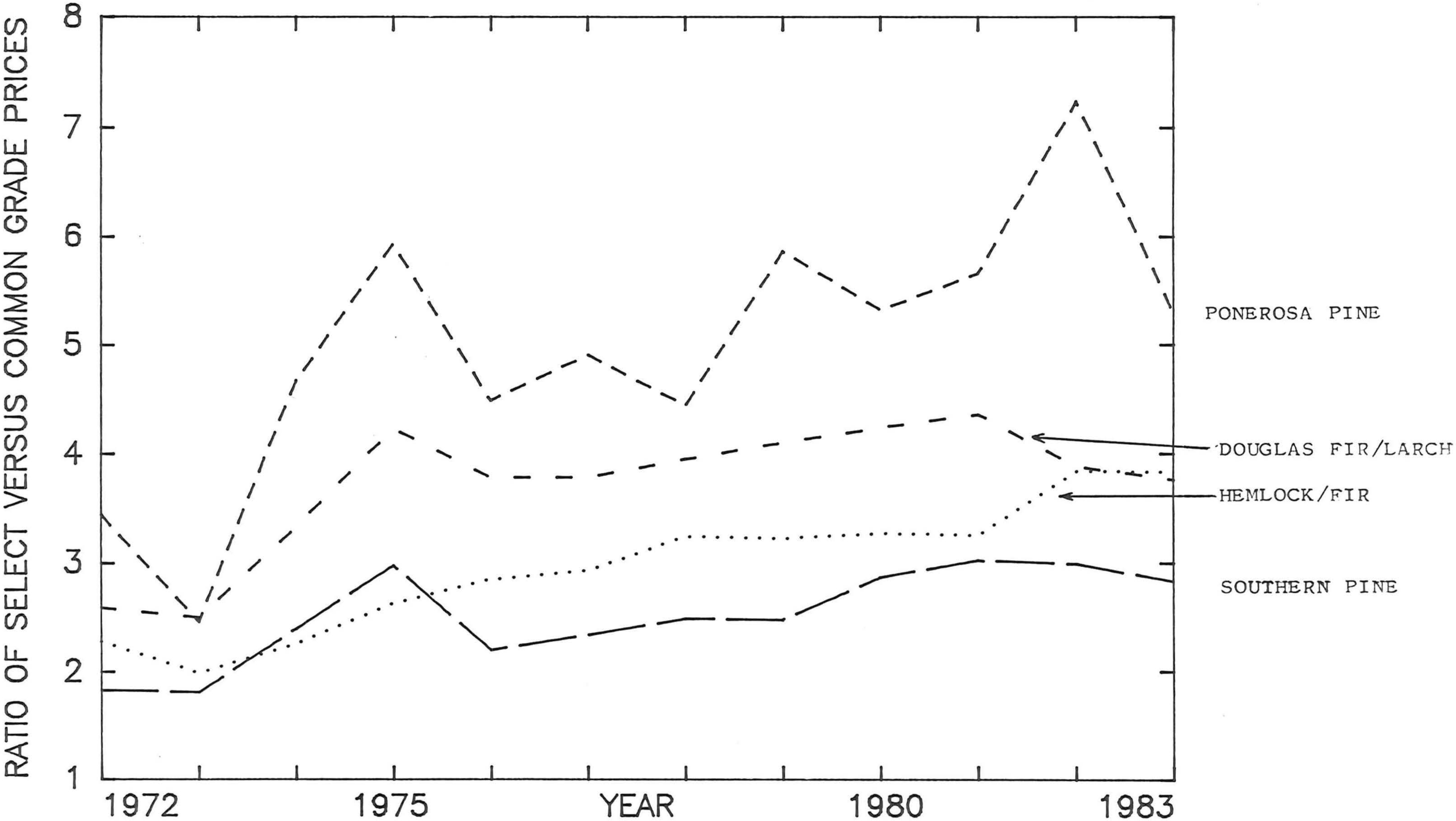


Figure: 6

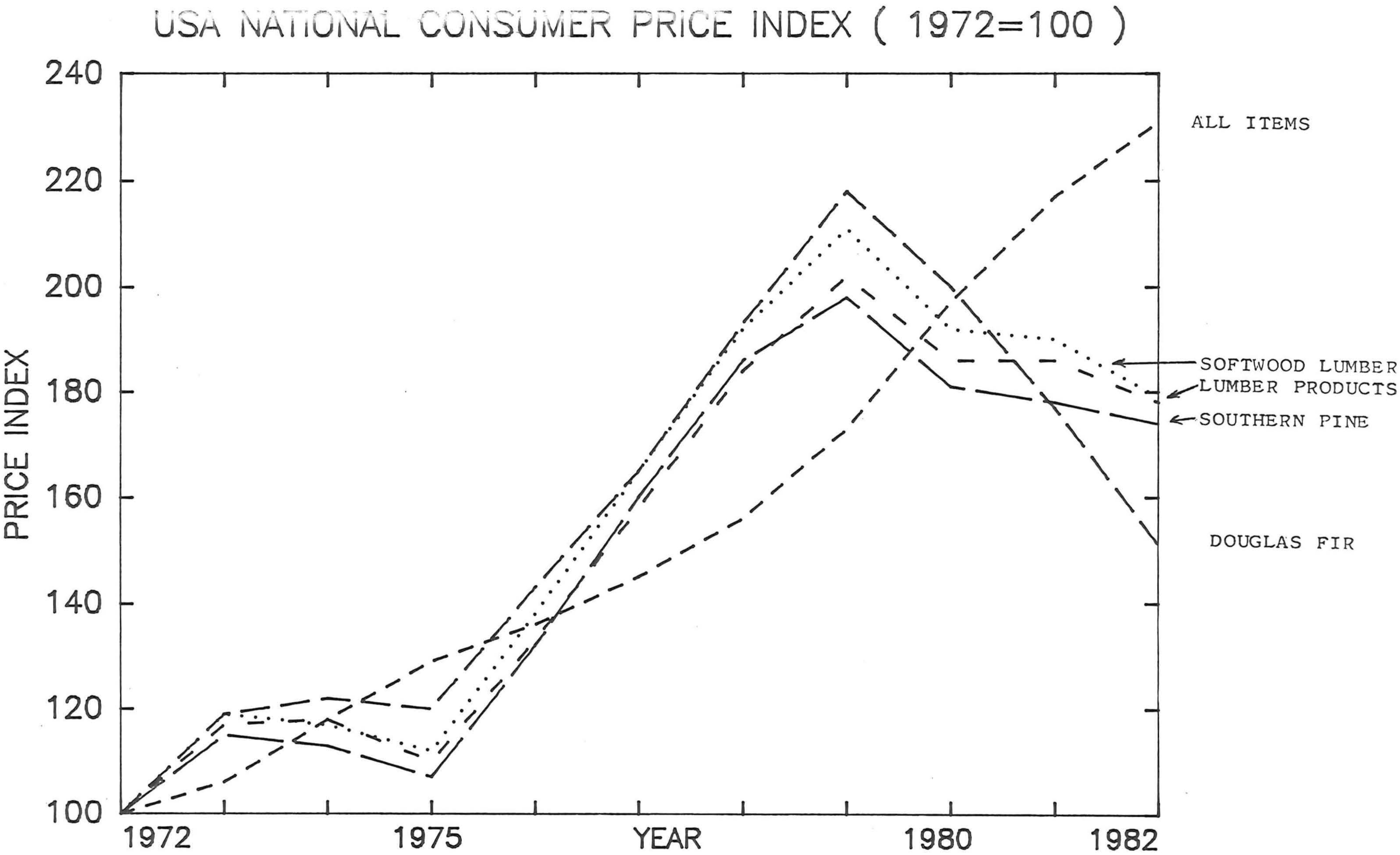

USA NATIONAL CONSUMER PRICE INDEX (1972=100)
PRICE INDEX
240
220
200
180
160
140
120
100
1972
1975
YEAR
1980
1982
ALL ITEMS
SOFTWOOD LUMBER
LUMBER PRODUCTS
SOUTHERN PINE
DOUGLAS FIR

Figure : 7

timber mixes the index fell dramatically for the common grade.

Conclusions from these facts and figures is that the price for higher quality grades is increasing ahead of inflation. The calculated quality ratios though could be somewhat inflated due to the low and slowly rising prices for the standard grades.

Using the prices for these sort of index calculations is stretching their usefulness though. Further more detailed analysis and conclusions drawn would be academic and possibly unrealistic.

(ii) Depletion of first growth stands

As has been mentioned, the supply of timber on the West Coast of the USA will in future be increasingly from second growth younger stands. The size and quality of timber harvested is expected to decline as a result of this (see Appendix 3 for an estimate of future grade outturn from second growth stands). Therefore the large increases in finishing grade prices could be as a result of the expected future shortage of quality timber. The situation is analogous to one in New Zealand. There is an increasing demand for high quality rimu because of the reduction in supply from the West Coast from 1990 onwards (M.H. Hitching, pers.comm.).

The lower quality ratio experienced for southern pine timber in the USA supports this argument. There is a large resource of this timber that is capable of a large annual sustainable production (Zivnuska, 1979). Therefore there is little chance of there being a shortage of this timber in the future. Any imports of radiata pine clearwood could be seen in the same light.

(iii) Quality of the species of timber

Obviously the timber that the market perceives to be the best quality will fetch higer prices. This is an example of the basic economic law of greater demand causing a greater price. Quality of the lower grades is not as important due to their less exacting end uses. Therefore the greater quality ratio for ponderosa pine is because it is viewed as the highest quality finishing grade timber.

2.6 Summary of the prices

The arguments raised above may reduce the significance of the increasing quality ratios, but it cannot be denied that this market is paying increasingly higher relative prices for higher quality timber. A simple conclusion which is fully discussed later, is that if New Zealand could export radiata pine timber to this market, then clearwood could fetch 2 to 4 times the price of structural grades. There is nothing that would indicate how long this trend is likely to continue though.

PART THREE

This part presents a method that can be used to predict clearwood prices in various markets. As mentioned at the beginning of the paper, this method cannot be used for any long term timber price forecasts. From analysis of the timber price trends in the USA in part two it is apparent that the large fluctuations in price would preclude long term forecasts. Changing wood characteristics experienced during the changing of crops harvested, as on the West Coast of the USA would also hinder timber price forecasts.

Instead the method limits itself to predicting prices 3 years at most into the future from any point in time. This should enable information useful for the marketing or selling of clearwood to be calculated. The method is designed around investigating the characteristics of selected markets in relation to prices and uses of radiata pine timber on that market. This information is then related where appropriate to possible uses of clearwood in order to predict a price for this timber. The characteristics of the market that are investigated are in order:

- The country's timber supply situation.
- The timber price determination system.
- Market perception of radiata pine timber.
- Prices paid for equivalent softwood timbers.

The reasons for choice of these characteristics and how they are analysed are outlined below. The timber price data from the USA is used to provide a practical example of how the method works. A conclusion on the effectiveness of it for the USA is then made.

3.1 The country's timber supply situation

This is basic to the whole method. If a country is to meets its domestic timber demands internally, then there should be little or no demand for imports of wood. Sutton (1975) performed an investigation of the competition that can be expected from selected timber producing countries. This for any country will show whether they are expected to have a deficit or surplus timber supply in the future. Other information sources are provided by the US Department of Agriculture, Forest Service Division and the FAO.

If a country is forecast to be able to meet domestic timber demands then this method stops here. Some countries with wood surpluses (eg. New Zealand) will still import softwood timbers for specialist uses though. This method will assume that any Pacific Rimu market in this wood surplus situation will import their specialist timber needs from North America. For the purposes of these small shipments clearwood would be outcompeted by high quality timber exports from Canada and the USA. If clearwood was sold in small volumes the conditions of sale would be so unique that the price paid would be difficult to assess by this method.

So the first step is to determine whether there is need for timber by the market in question. Whether this demand could be for clearwood is assessed later. Sutton (1975) showed that whereas selected New Zealand forest products might find difficulty competing for a market, in most cases clearwood will have an advantage.

USA example

Some forest products import and export statistics of the USA are shown in Appendix 6. As is shown the trade is dominated by the West Coast. Most of the imports of sawn timber are from Canada and go to the West Coast and Mid-west regions of the USA. An efficient rail system reduces the transport costs of these imports.

The log trade is dominated by large exports to Japan. Smaller volumes are supplied to China, Canada, the Korean Republic and others. The sawn timber trade is dominated by large imports from Canada. A large number of countries import sawn timber from the USA. These are dominated by Japan, Latin America and Canada. An interesting point is the significant volume traded with Australia (242,000 m^3 in 1982). This demonstrates the competitive ability of North American countries in Pacific Rim markets.

No references read by the author will specifically state what will be the future pattern of the USA's world timber trade. Predictions of this sort are difficult due to the large number of owners of the nation's forests and the volatile nature of market demands (USDA, 1982). However in Appendix 6 is a table of future imports and exports of the USA as projected by the US Forest Service Division.

Twenty-one million cubic metres of timber imported in 1982 (FAO, 1984) while still exporting significant volumes of logs and timber would indicate that there should in future continue to be a demand for sawn timber imports. For the purpose of this study it is concluded that the USA is large enough to absord significant proportions (possibly all) of New Zealand's clearwood production.

3.2 Timber price determination

This is what is determining the timber prices in the country under investigation. There are two ways; one is the free market forces of supply and demand and the other is regulation by a central government or private industry organisation.

This information on a country is needed to determine who is to evaluate the desirability of paying a certain price for clearwood. If this is determinend by free market forces then historical decisions on timber quality and prices paid can be used to predict the price paid for clearwood. If the price is determined by a central organisation, then other factors like protection of local producers will also be a factor in setting a price. These sort of decisions are much more difficult to predict and fall outside of the capabilities of this method. The assumption can be made that any price fixing organisation will be trying to decide what the market demands are, and set the prices accordingly. However this method functions better if a free market situation operates in the country analysed.

USA example

As already discussed the USA has a free market price determination system. The price paid for each grade is determined by the availability and what is an acceptable price as agreed on by a willing buyer and seller. Changing supply and demand causes the large fluctuations in price.

So the method has so far determined that the USA should have a demand for imports from New Zealand of clearwood. This step now states that prices paid will be determined by a free market.

3.3 Market perception of radiata pine

Once the sector that will determine the price in a country has been determined then the judgement this sector has of radiata pine is determined. This judgement or perception of radiata pine can only be possible if this country has imported or produced this timber in the past. Imports of radiata pine could be from New Zealand, Chile or Australia, as long as the market has had an opportunity to judge it.

The perception can only be of the structural, packaging and factory grades exported in the past as no large volumes of clearwood have been exported. If the timber is viewed poorly then it is likely that low prices for the clearwood will be paid. Also if radiata pine timber is viewed primarily as a low quality timber as on the Japanese market (Ashenden, 1979) then acceptance of clearwood could be difficult.

USA example

The USA provides an example of how the lack of large radiata pine importations can be overcome sufficiently for the purposes of this investigation. Just recently small shipments of radiata pine factory grades have been sold to the West Coast of the USA. Initial reports back show that the timber is viewed as equivalent to the top end of the local pines (L. Heenan, pers.comm.). An anonymous source quoted a price of $\$525/m^3$ F.A.S. with shipment costs of around $120/m^3 (New Zealand currency). Adding these two prices together and with the current exchange rate of 0.50 (NZ$ ÷ USA$) a price of around US$320/m^3 would be paid for these factory grades on the USA market. From the timber prices for various grades and species in part two this does indicate that radiata pine is viewed as better than the southern pines but of lesser quality than ponderosa pine.

3.4 Prices paid for equivalent timbers

This is the last step. If all of the above are favourable and it appears as though clearwood has a promising market then this situation should last for an indefinite length of time. Now the price that clearwood could receive on any market is determined. The market perception of radiata pine can be used to determine which timber species it is viewed as equivalent to. The price paid for long clear timber grades of the equivalent timber is then used to determine the price for clearwood. Obviously the two prices will not be equal, so the prices presented here are subjective and are based on whether clearwood is perceived as slightly better or worse quality.

USA example

The USA as outlined would view clearwood as better than southern pines and equivalent price wise to the Douglas fir/larch and hemlock/fir groupings. The change in the characteristics of these groups with the change of crops could change this ranking to radiata pine's advantage. Douglas fir when grown on short rotations will have wide growth rings. This will emphasize the difference in density of the early and late wood. Because of this it will not give a good natural finish when dressed (NZFS, 1982) and consequently could be disfavoured in the future as a select grade.

However based on 1983 USA prices for long clears of Douglas fir/larch a prediction of around $280 US is made. This is a lower price than that stated before for radiata pine factory grades. These factory grades are being targeted at and cut to length for selected end markets (eg. Baby cots). Prices paid for these markets would be higher than the average price paid by all consumers, which is what the above figure is. The marketing and the effect it could have on improving the price is beyond the scope of this paper. It is sufficient to say that the predicted prices in this paper could be viewed as a minimum.

3.5 Discussion

It appears from the above trial that the USA timber market characteristics are compatible with the method of price determination. Also enough information is known about this market to predict a price that clearwood might receive at present. This is not surprising as the method was designed to use this available data.

Now the method is applied to other markets in part four to investigate the outlined characteristics of certain promising New Zealand timber export markets. If a prediction of a price for clearwood in any market is difficult or impossible using this method then an evaluation will be made of a number of other factors. These are;

- Whether the method is applicable to that market or if another method of determining timber prices should be used.
- What extra data on the market in question is needed if the method is applicable.

PART FOUR

Market Analysis

This part analyses selected markets individually. The markets investigated in the following order are;

- New Zealand
- Australia
- Japan

A greater number of countries than these import New Zealand radiata pine timber. Also there are many other countries that show promise as a future market for New Zealand timber exports. However the countries listed will serve as a demonstration of the method. If the method cannot be applied fully due to a lack of information on these large markets, then application to smaller markets would be very difficult.

4.1 New Zealand

The New Zealand timber industry is characterized by the dominating influence of radiata pine timber. This species comprised 82% of the sawn timber produced in 1983 (NZFS, 1984).

New Zealand has one of the highest per capita consumption of sawn timber in the world (MacGregor, 1970). This is a reflection on a history of a large available indigenous timber resource and at present a large exotic timber resource.

The application of the method to determine what might be the price of clearwood in the future is as follows.

(i) Timber supply situation

This aspect differs from that discussed for other countries. When clearwood is eventually produced in large volumes, then it follows that a proportion of the production will be consumed locally. As mentioned substitution by MDF and competition from factory grades of radiata pine are unpredictable variables. It is these variables that will determine the amount of clearwood consumed domestically. However it is assumed that some 50,000-100,000 m^3 could be consumed with increasing amounts consumed as production rises. Whatever the exact volume is it is likely to be a significant proportion of the domestic finishing grade market.

More precise information is needed on all aspects of competing products if this estimate of future consumption is to be refined.

(ii) Timber price determination

A postal survey of selected sawmills in New Zealand showed that most follow the timber price guidelines of the New Zealand Timber Industry Federation (NZTIF). Contacting this organisation revealed that timber prices in New Zealand have been controlled for the past 70 years.

> "Following the removal of price control from exotic timber in February 1982 a series of meetings were held to develop market related prices. This involved not just relativities of timber prices in isolation but following through the market influence of competitive products. Before this exercise was complete the 1982 Price Freeze was put in place so little has so far been achieved.
>
> Looking forward it appears we will have to operate in a controlled economy for some years. The trend will be for prices to increase in furniture and finishing uses." (Lou Heenan, Secretary NZTIF, pers.comm.).

Future control of timber prices in New Zealand will lower the effectiveness of the price prediction method. However it seems as though prices will be set in relation to market demand and not for protection from imports etc. So past prices which are an indication of market demand can be used to assess the New Zealand public's perception of radiata pine.

(iii) Market perception of radiata pine

Despite the dominating influence of radiata pine on the New Zealand timber industry, this is still a difficult subject to obtain information on. No doubt each New Zealand reader of this paper will have his own opinion of radiata pine timber. It should hopefully be somewhere in the following range.

Radiata pine is viewed as a general purpose timber suitable for a wide range of uses. Hardly a house in New Zealand would be without a piece of joinery made of radiata pine (Sutton, 1975).

The difficulty now arises when equating radiata pine with other softwood timbers available on the New Zealand market. There are no exotic timbers produced in New Zealand that would produce significant lengths and volumes of finishing grades. If radiata pine was to be equated with a West Coast North American timber species, it would most likely be Douglas fir. The end uses of the two timbers are different though, with Douglas fir mainly used for interior exposed beams (NZFS, 1982).

The method falls down somewhat here and a random collection of prices and references is needed in the next section to gain a price prediction.

(iv) Prices paid for equivalent timbers

As is shown above, this section is redundant in relation to the New Zealand market. Instead a number of other ways of determining a price for clearwood are used. These, as mentioned are just random facts that are relevant in showing what clearwood might fetch in price.

The USA market as shown, is currently paying 3 to 4 times the price for a Douglas fir/larch clear as opposed to a No.3 common.

Whiteside (1982) showed that out of a small sample of New Zealand furniture manufacturers, some indicated that they would pay up to $\$270/m^3$ for a number 1 radiata pine clear. Others commented that they would only pay the same price as for factory grades of the timber.

Timber prices that have been paid in the past for various grades of radiata pine are listed in Table 3. Prices have been converted to wholesale, as all previous prices in this paper were also at wholesale.

Table 3: Past timber prices for radiata pine in New Zealand ($NZ\$/m^3$)

Grade	Year 1975	1983
Factory	52	149
Dressing	62	176
Merchantable	40	121
Boxing	36	110
No.1 Framing	57	163
No.2 Framing	48	140

Notes: (1) Figures are as supplied by L. Heenan of the NZTIF.
(2) For board grades a base size of 150 x 25 mm is used.
(3) For framing grades a base size of 100 x 50 mm is used.
(4) Prices for 1983 will be those for 1982, 1983, 1984 due to the price freeze.

In the past radiata pine timber grades have experienced opposite price trends as those in the USA. In New Zealand, prices of structural and board grades are increasing in relation to those for finishing grades. A reason for this trend in prices and the small differential between finishing and other grades is probably due to the commodity nature of radiata pine in New Zealand.

So from the above random outline of factors present in New Zealand, the following prediction is made. Price paid for clearwood in New Zealand will at most be only around 50 to 60% above prices for common and structural grades. This reflects on the difference between the USA and the New Zealand market. Because of the relatively high prices paid for structural grades in New Zealand as opposed to the USA, this 50-60% premium for clearwood could represent a profitable rate of return on the investment of pruning.

4.2 Australia

Tables 4 and 5 show Australia's past imports of forest products from New Zealand. Australia is New Zealand's largest foreign market for these goods. Most of the sales are of the highly processed products of woodpulp, paper and paperboard. The value of solid wood products are however second in value to New Zealand's exports of them to Japan.

Radiata pine has been planted extensively in Australia. With a history of imports of sawn timber from New Zealand since the early 1950s it is a well known and accepted timber. Plantations of radiata pine have not been

Table: 4

Exports of Forest Products from New Zealand by Major Countries of Destination—Quantity

Year Ended June	Logs and Poles 000 m^3 (roundwood)	Sawn Timber 000 m^3 (sawn)	Wood Pulp Tonnes	Paper and Paperboard Tonnes
1	2	3	4	5
		Australia		
1966	—	68	58 428	117 990
1967	2	66	63 587	95 714
1968	1	89	60 424	125 027
1969	9	135	65 669	120 339
1970	1	130	72 909	120 392
1971	—	110	81 837	114 163
1972	—	107	85 658	134 027
1973	1	102	92 928	122 464
1974	—	98	110 015	129 516
1975	—	62	127 450	137 141
1976	—	84	136 346	138 696
1977	2	98	145 091	175 207
1978	—	107	141 181	140 433
1979	2	118	142 671	144 432
1980	2	179	139 799	156 070
1981	11	192	154 406	165 440
1982	—*r*	208*r*	146 005*r*	170 969*r*
1983	—	165	116 378	65 816
		Japan		
1966	442	—	11 045	172
1967	516	—	6 775	102
1968	1 136	53	9 639	6 485
1969	1 422	89	7 203	2 566
1970	1 748	82	984	132
1971	1 772	92	2 954	5
1972	1 836	96	1 558	156
1973	1 873	107	13 633	386
1974	1 411	122	77 110	5
1975	694	81	141 766	374
1976	675	98	152 649	217
1977	999	148	218 579	926
1978	932	200	236 006	1 167
1979	893	268	207 959	3 699
1980	941	316	242 390	3 645
1981	682	342	262 612	2 568
1982	434	262*r*	173 083*r*	626*r*
1983	348	252	213 943	138
		Other Countries		
1966	42	9	1 987	2 473
1967	46	6	3 124	2 795
1968	88	11	5 471	7 413
1969	83	19	16 265	18 828
1970	51	43	8 224	32 556
1971	51	74	11 354	16 541
1972	35	63	27 042	20 362
1973	81	41	34 952	25 159
1974	39	26	44 869	14 936
1975	1	27	43 387	35 214
1976	39	18	70 924	77 510
1977	135	22	56 728	80 002
1978	138	26	52 703	120 458
1979	154	43	92 601	158 338
1980	304	58	96 550	157 839
1981	110	62	98 244	160 294
1982	39	26*r*	102 488*r*	140 923*r*
1983	92	21	120 556	177 701
		Total All Countries		
1966	484	77	71 460	120 635
1967	564	72	73 486	98 611
1968	1 225	153	75 534	138 925
1969	1 514	243	89 137	141 733
1970	1 800	255	82 117	153 080
1971	1 823	276	96 145	130 709
1972	1 871	266	114 258	154 545
1973	1 954	250	141 513	148 009
1974	1 450	246	231 994	144 457
1975	695	170	312 603	172 729
1976	714	200	359 919	216 423
1977	1 136	268	420 398	256 135
1978	1 070	333	429 890	262 058
1979	1 049	429	443 231	306 469
1980	1 247	553	478 739	317 554
1981	803	596	515 262	328 302
1982	473*r*	496*r*	421 576*r*	312 518*r*
1983	440	438	450 877	243 655

Source: NZFS (1984)

Table: 5 Source: NZFS (1984)

EXPORTS OF FOREST PRODUCTS FROM NEW ZEALAND BY MAJOR COUNTRIES OF DESTINATION—VALUE

Thousand dollars

Year Ended June		Logs and Poles	Sawn Timber	Wood Pulp	Paper and Paper-board	Miscel-laneous Forest Products	Total Forest Products	Forest Products as Per-centage of Total Exports
1		2	3	4	5	6	7	8
				Australia				
1967	..	23	1,748	5,114	10,293	261	17,439	50
1968	..	10	2,998	4,998	15,904	642	24,552	43
1969	..	118	5,226	5,589	16,303	1,507	28,743	38
1970	..	14	5,556	6,252	16,390	1,788	30,000	34
1971	..	—	4,815	7,720	15,513	1,975	30,023	31
1972	..	1	4,662	8,387	18,374	2,152	33,576	30
1973	..	12	5,029	9,560	17,938	2,310	34,849	27
1974	..	—	6,469	12,862	22,574	3,084	44,989	26
1975	..	—	4,485	19,358	26,810	2,885	53,538	29
1976	..	4	7,113	24,424	42,822	4,717	79,080	33
1977	..	75	9,580	29,558	59,286	6,616	105,115	29
1978	..	28	9,721	30,123	46,781	8,960	95,613	23
1979	..	112	14,533	33,564	47,059	16,132	111,399	22
1980	..	170	26,578	46,624	62,971	26,514	162,857	26
1981	..	728	40,227	65,440	79,733	37,200	223,328	27
1982	..	8*r*	45,200*r*	72,662*r*	110,165*r*	45,211*r*	273,246*r*	27
1983	..	8	36,655	56,594	50,803	38,484	182,544	19
				Japan				
1967	..	4,856	2	522	9	—	5,389	8
1968	..	10,863	1,275	703	714	—	13,555	20
1969	..	18,838	2,239	561	263	43	21,944	25
1970	..	23,350	2,005	106	15	883	26,359	25
1971	..	25,531	2,519	291	1	1,593	29,935	29
1972	..	29,447	2,715	138	19	2,493	34,812	27
1973	..	32,706	3,202	1,198	40	3,722	40,868	18
1974	..	33,430	5,174	6,680	2	3,487	48,773	20
1975	..	17,531	3,942	14,858	107	5,652	42,090	23
1976	..	18,073	4,295	18,099	69	6,686	47,222	17
1977	..	27,611	7,320	26,286	259	8,214	69,690	18
1978	..	32,732	11,701	28,952	286	9,446	83,117	19
1979	..	34,991	17,664	30,385	960	10,860	94,861	16
1980	..	48,844	29,532	43,118	1,306	15,832	138,632	22
1981	..	42,786	37,126	50,723	1,048	22,248	153,931	20
1982	..	26,878*r*	28,566*r*	42,146*r*	330*r*	22,933*r*	120,853*r*	14
1983	..	22,563	29,987	61,121	77	29,362	143,110	13
				Other Countries				
1967	..	433	245	268	269	343	1,558	—
1968	..	854	489	450	791	600	3,184	—
1969	..	1,128	936	1,297	2,175	1,424	6,960	1
1970	..	710	2,441	879	4,021	2,115	10,166	1
1971	..	735	3,503	1,365	2,429	3,479	11,511	1
1972	..	580	3,193	2,647	2,806	4,372	13,598	1
1973	..	1,463	2,462	3,341	3,079	3,664	14,009	1
1974	..	822	1,874	6,031	2,919	2,769	14,415	1
1975	..	34	2,111	9,371	8,958	2,876	23,350	2
1976	..	1,123	1,399	16,258	18,388	3,890	41,058	3
1977	..	3,882	2,014	14,183	19,701	5,871	45,651	2
1978	..	4,995	2,553	10,644	29,306	7,518	55,016	2
1979	..	5,899	4,933	22,342	42,164	17,685	93,023	3
1980	..	13,129	8,719	30,485	59,834	32,066	144,233	4
1981	..	5,865	9,818	35,140	72,230	32,502	155,555	3
1982	..	2,041*r*	5,921*r*	40,910*r*	72,315*r*	35,576*r*	156,763*r*	3
1983	..	5,775	5,797	43,561	83,525	38,091	176,748	3
				Total All Countries				
1967	..	5,312	1,995	5,904	10,572	604	24,387	3
1968	..	11,727	4,762	6,151	17,409	1,242	41,291	5
1969	..	20,084	8,401	7,447	18,741	2,974	57,647	6
1970	..	24,074	10,002	7,237	20,426	4,786	66,525	6
1971	..	26,266	10,837	9,376	17,943	7,047	71,469	6
1972	..	30,028	10,570	11,172	21,199	9.017	81,986	6
1973	..	34,181	10,693	14,099	21,057	9,696	89,726	5
1974	..	34,252	13,517	25,573	25,495	9,340	108,177	6
1975	..	17,565	10,538	43,587	35,875	11,413	118,978	8
1976	..	19,200	12,807	58,781	61,279	15,293	167,360	9
1977	..	31,568	18,914	70,027	79,246	20,701	220,456	7
1978	..	37,755	23,975	69,719	76,373	25,924	233,746	7
1979	..	41,002	37,130	86,291	90,183	44,677	299,283	8
1980	..	62,143	64,829	120,227	123,111	74,412	445,722	9
1981	..	49,379	87,171	151,303	153,011	91,950	532,814	9
1982	..	28,927*r*	79,687*r*	155,718*r*	182,810*r*	103,720*r*	550,862*r*	8
1983	..	28,345	72,438	161,276	134,405	105,938	502,402	7

NOTE—"Miscellaneous Forest Products" includes panel products, all wood manufactures, manufactures of paper and paperboard, cork and cork products, fuel wood and charcoal, waste paper, and wood chips. Exports of wood chips to Japan, which started in November 1969, were valued at $8.1 million for the year ended June 1977.

managed to the same degree as New Zealand's with the following attitude to pruning seeming to prevail.

> "It is relatively simple to eliminate knots in later formed wood by early pruning. Pruning is however not universally practised in Australia because of its doubtful economic benefits. The effect of pruning on the strength of subsequently formed wood is not well known and it is likely that for a period of time strength will be reduced by the irregularly oriented grain resulting from the over growth of the prune branch. Clearly however for the production of high quality dressing grades in radiata pine pruning is most desirable and should be given a higher priority." (Bamber et al., 1983)

The following analysis of market characteristics will reveal much the same situation as for New Zealand. The major difference though is the variety of sawn timber sold in Australia. See Appendix 6 for an outline of recent imports of sawn timber. Locally grown softwoods besides Pinus radiata are P. elliottii (Slash pine), P. caribea, P. taeda (loblolly pine) and the native Araucaria.

(i) Timber supply situation

The following two quotes show that clearwood should have a ready market in Australia in the future.

> "So even if Australia does become self-sufficient in volumetric terms she will not be in a quality sense. In the long term the product most likely to be in shortest supply in the Australian market is coniferous clearwood." (Sutton, 1975)

> "The strength of the Australian economy together with the continuation of provisions under NAFTA make Australia an ideal market. The ability for producers to integrate downstream into the market and diversify their products are advantageous, if not necessary, strategies. The strength of the Australian currency and its likely revaluation with respect to New Zealand currency should further enhance this market." (Coppens, 1980).

(ii) Timber price determination

As the country is divided into states no over-riding authority determines timber prices. Due to a tougher commerce act than what New Zealand has, collaboration on price setting is discouraged. Therefore timber prices are being determined by a free market.

(iii) Market perception of radiata pine

Because of a history of radiata pine being a common timber used in Australia, it will have much the same judgement as New Zealand of this timber species. The variety of timbers available on the market would free it of any commodity species perception though.

The prices of New Zealand radiata pine exported to Sydney are shown in Table 6.

Table 6: Radiata pine to Australia from New Zealand ($A\$/m^3$ CIF Sydney)

Grade	Year 1979	1980	1981	1982	1983	1984
Factory	140	182	191	205	219	251
Merchantable	134	169	181	184	192	225
No.3 grade	106	142	156	146	137	141
Framing	160	205	211	215	219	252

Source: Anonymous

Notes: (1) For No.3 grade a base size of 150 x 25 mm is used.
(2) For framing grades a base size of 100 x 50 mm is used.

Prices paid for various grades are similar to those in New Zealand with little difference in prices paid for standard and finishing grades. Anonymous sources of information indicate that at present there is a large demand for radiata pine factory grades.

In summary radiata pine would be viewed on the Australian market as a general purpose timber which if desired could be used for high quality decorative uses.

(iv) Prices paid for equivalent timbers

As in New Zealand, radiata pine is probably viewed as of similar quality to Douglas fir. At present radiata pine is fetching a greater price than Douglas fir for both dressed and undressed grades of sawn timber (Bureau of Agricultural Economics, 1984).

Unfortunately little or no detailed information is available to the author on prices paid for Douglas fir grades of timber in Australia. If this information were available for clear grades of timber then a prediction of the price for clearwood should be possible.

4.3 Japan

New Zealand has been selling forest products to Japan since the early 1960s when radiata pine logs were first exported. As can be seen from Tables 4 and 5 the sale of logs has been the main solid wood product exported in the past, both in quantity and value.

It is Japan that arouses more interest and conflicting opinion from within the New Zealand timber industry on its value as a market for sawn timber than any other foreign market. This is due to reasons stated in the "Forest Industry Study".

> "Japan is the only country for which demand increases and ability to pay are known to be large enough to absorb a large share of the potential increase in New Zealand's exports and where we can expect to be reasonably competitive." (DFC, 1980).

Debate on the Japanese forest products market has almost led to a complete concentration of information on it and New Zealand's future export prospects to it. Prices paid for solid wood products relative to Chile are often reported in the newspaper, and are almost always depressing for New Zealand exporters (see Appendix 6).

(i) Timber supply situation

> "Post World War II industrial expansion in Japan led to expanded demands for raw materials and a several-fold expansion of consumption of timber products to a record high of 122 million m^3 roundwood equivalent, in 1973. In response to a cyclical downturn in demand, consumption of timber products declined to 96 million m^3 in 1977.
>
> Japan is heavily forested. However, its timber resources are relatively limited in relation to population. Japanese forests were also severely depleted in World War II. As a result of planned reductions in harvest to build up timber inventories and land use changes, production of timber from domestic sources in Japan has gone through a period of decline. This has continued during recent years - output fell from 51 million m^3 in 1966 to 34 million m^3 in 1975. This has reflected in part land use changes. Timber from domestic sources fell from 67 percent of Japanese consumption in 1966 to 33 percent in 1977." (USDA, 1982).

Japan's past imports of sawlogs and sawn timber are shown in Table 7 and 8.

From these it would appear that Japan will continue to be heavily dependent on imports of sawn timber to meet its future domestic demands. Coppens (1980) stated a target of imports from New Zealand constituting 10% of all Japan's timber imports by the year 2000. This would be in the range of 2.5 to 4.5 million m^3.

Table 7: Japanese imports of softwood sawlogs and veneer logs by country of origin (000 m^3)

Year	USA	Canada	USSR	New Zealand	Chile	Indonesia	Total
1975	9297	175	6895	454	-	280	17101
1976	10021	257	7332	800	-	294	18704
1977	11116	495	7349	897	-	329	20186
1978	11960	407	7432	777	-	241	20817
1979	14228	196	6236	1016	237	331	22244
1980	11473	643	5176	773	338	217	18620
1981	8012	595	4509	497	40	242	13895
1982	8938	588	4943	439	99	151	15158

Source: FAO, 1977 to 1984.

Table 8: Japanese imports of softwood sawnwood by country of origin (000 m^3)

Year	Canada	USA	USSR	Chile	New Zealand	Total
1975	989	1086	103	-	81	2259
1976	1453	1076	109	2	98	2738
1977	1666	1030	113	32	148	2989
1978	1776	901	118	40	200	3035
1979	2380	1510	121	28	268	4307
1980	2578	1496	136	38	316	4564
1981	2047	1195	111	-	342	3695
1982	2474	1441	120	-	262	4297

Source: FAO, 1977 to 1984.

(ii) Timber price determination

Not much information is available on this factor. Imports of forest products are controlled by large trading houses (Sogo Schousa) which distribute imported logs and timber to the end markets (Ashenden, 1979). Prices would be best set by these Sogo Schousa in relation to the market demand for the timber. Due to the large number of countries exporting timber to Japan, radiata pine would be selling in a competitive environment.

(iii) Market perception of radiata pine

The interest and debate in New Zealand on the Japanese market focuses largely on this area. A number of authors, trade missions etc. have reported on this aspect, and it dominates every conclusion made on timber exports to Japan. The concensus of opinion is that radiata pine is viewed as a low strength, medium density and hardness timber suitable mainly for packaging. Some will qualify this with a high quality packaging timber statement. Its principal use in packaging is electrical cable drums, pallets etc. The timber's easy nailing abililty is appreciated. It is because of its relatively low price compared with other imported timbers that it is liked for packaging. The price paid for radiata pine timber will fluctuate with the market but it almost always is the lowest priced imported timber (Ashenden, 1979).

This low opinion of radiata pine timber is due to the following reasons.

- The large ring width of the fast grown timber is interpreted to mean low strength.

- New Zealand has traditionally viewed Japan as a dumping ground for a range in quality timber. Often logs harvested from windthrows have been exported to Japan.

"It could be said cynically that the Japanese market currently represents only an opportunity for New Zealand producers to quit low value, poor quality material, unacceptable on the domestic or other exporters at prices possible due to current export incentives." (Coppens, 1980).

As a result the average qualilty of timber and logs exported to Japan has been low. Some of this low quality timber failed in the early 1970s when treated as equivalent to imported softwoods.

- Because of Japan's buying power, better quality more expensive timber from North America has been used for structural and finishing uses which are more demanding (appearance wise) on a timber than packaging.

  Also the level of exports from New Zealand in 1975 was around half that of 1974. New Zealand is viewed as an unreliable supplier because of this (Ashenden, 1979).

The clearest indication of Japan's judgement of the timber is that of the Japanese Agricultural Standards. This organisation removed radiata pine from the spruce, pine, fir grouping and has placed it in the hemlock group. The New Zealand Forest Service hopes to have radiata pine treated on the same basis as western hemlock (Tsurutu, 1981). It is with western hemlock that radiata pine is equated with to gain a price prediction in the next section.

Whether the Japanese market will buy clearwood when radiata pine is at present only a packaging timber needs investigating though. Recent developments indicate that the Japanese will be buying clearwood in the form of sheets of veneer (N. Clifton, pers.comm.). With this apparent acceptance of radiata pine for quality uses, it could be argued that the Japanese could in future buy clearwood.

(iv) Prices paid for equivalent timbers

As is mentioned it is most likely that western hemlock is viewed as an equivalent timber to radiata pine on the Japanese market. As with the Australian market no detailed prices are available on grades of timber sold in Japan. If these were known there should be little difficulty in predicting a price for clearwood by equating it with the price paid for a western hemlock select grade.

DISCUSSION

(i) New Zealand

Data that needs to be made available, or have a way by which it could be obtained is chiefly the timber prices paid for each grade on a national basis. This would be most valuable if it were for all locally produced and imported timbers. The substitution of clearwood by other products will need to be investigated. The important effect of the price of each substitute will need investigation, as well as the public perception of each product.

Even if this information about the New Zealand market were available the lack of competitive softwood timbers makes this method difficult to apply to New Zealand. Identifying the substitutes can be carried out. Equating the radiata pine timber with a similar timber is difficult as no large volumes of other softwood timbers are sold in New Zealand. Douglas fir is around 8% (NZFS, 1984) of the sawn timber produced. As it is mainly used for different purposes than radiata pine in New Zealand, then there is no value in equating the two.

(ii) Australia and Japan

More information is needed on the prices paid for softwoods on these markets. Investigation is also needed on what form of New Zealand's future export of clearwood to Japan will take. This could be any of a combination of veneer or saw logs, veneer sheets and sawn timber.

If this information were available though then this method should be applicable to these two countries. A price prediction for clearwood could be made that would possibly be right for the following 2 to 3 years.

(iii) <u>Difficulties of the investigation</u>

The two biggest problems in the overall study have been the lack of specific forms of information and the control over what to limit this study to. Assumptions have been made to overcome most deficiencies of information and these have all been indicated where appropriate. Control over what to limit this study to was mainly centred on the following areas for the reasons given.

Marketing strategy has been avoided because for any given market this could comprise a large and wide ranging investigation. Marketing strategy should not affect the application of the method of price prediction apart from raising the price. Indeed this method could be applied to individual sectors of any market if so desired.

Competition from other countries has largely been ignored. New Zealand exports less than 1% of the world trade in sawn timber (FAO, 1984). It is due to this relatively small size of imports, even after the mid 1990s, that it is assumed that New Zealand can export its forest products to most markets without having special obstacles or trade barriers placed against it. For example future trade with the USA would be small in comparison with the Canada to the USA trade. Canada should not lower its prices of timber or carry out special sale strategies just to exclude New Zealand from that market. Tarrif barriers that exist in any country are not considered as these are mostly of an added cost nature. For example Japan has 10% tarrifs against sawn timber imports from developed countries. This cost along with transport and other miscellaneous costs would be added to the predicted prices derived by the method. Any producer interested in the price he would receive could perform all the ancillary calculations on this predicted price for his own special needs.

Lastly another factor of control on what to include was author curiosity. A brief look at the Forest Products Abstracts will show the vast amount of data available on the world timber markets. A lot of knowledge was learnt during this investigation that could be not included in this paper. If it was it would have become even more confusing that it is at present.

CONCLUSIONS

New Zealand will have in the future large amounts of radiata pine clearwood available for export. A method of predicting market prices for this clearwood from investigation of market characteristics has been outlined. Applying this method to the market of the West Coast of the USA yielded a prediction of a price for exported clearwood. This is based on a price equality of radiata pine to Douglas fir/larch and hemlock/fir. However the only true test of this price and the applicability of the method will be when large volumes of clearwood are actually sold on the market.

When the method is applied to New Zealand the dominance of the timber market by radiata pine has the effect of preventing a price prediction. Instead a rough price of aroung 50-60% greater than a radiata pine structural or board grade was predicted.

When applied to the markets of Australia and Japan prediction of price was not possible. This is due to lack of information. These countries differ in aspects of timber production and use from the USA for which this method was designed. However given enough of the right information on these markets this method could be applied to give a price prediction for clearwood.

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APPENDICES

NOTES

1. Appendix 4 contains two photocopied reports. Numbering of the pages and tables is different from that in this report.

2. Timber prices in Appendix 5 are those presented in the graphs of part two of the main text.

3. Each appendix is only differentiated by the individual numbering of them.

Table 9: Tending schedule - "Direct Regime"

Mean height crop trees (m)	Operation
-	Plant 1500 stems/ha (spacing approximately 3.7 x 1.8 m)
4.9	Prune the best 740-620 stems/ha 0-2.4 m. Thin all others (no yield)
7.9	Prune the best 370-320 stems/ha 2.4-4.3 m. (If incorporating grazing, thin all others)
10.7	Prune the best 200 stems/ha 4.3-6.1 m. Thin all others (no yield)
13.7	Prune up to 200 stems/ha (if multinodals) 6.1-8.5 m.
16.8	Prune up to 200 stems/ha (if multinodals) 8.5-11.0 m.

Source: Sutton (1981)

Table: 10

GROWTH OF EXOTIC FOREST AREA SINCE 1921

(000 hectares)

Year Ended 31 March	New Area Planted			Net Productive Stocked Area		
	State	*Private*	*Total*	*State*	*Private*	*Total*
1	2	3	4	5	6	7
1921	1	—	1	16	61	77
1926	6	8	14	32	66	98
1931	22	15	37	124	123	247
1936	5	7	12	170	147	317
1937	3	4	7	172	149	321
1938	1	2	3	173	151	324
1939	1	—	1	175	150	325
1940	3	—	3	178	149	327
1941	2	—	2	179	150	329
1942	2	—	2	181	149	330
1943	1	—	1	182	149	331
1944	1	—	1	182	149	331
1945	1	—	1	183	149	332
1946	—	—	—	183	149	332
1947	—	—	—	183	150	333
1948	1	—	1	185	149	334
1949	2	—	2	187	148	335
1950	2	—	2	187	149	336
1951	2	1	3	187	151	338
1952	2	1	3	189	151	340
1953	2	1	3	190	151	341
1954	2	1	3	191	151	342
1955	2	2	4	192	152	344
1956	3	2	5	192	154	346
1957	3	2	5	193	155	348
1958	3	2	5	194	156	350
1959	3	2	5	195	157	352
1960	3	2	5	195	157	352
1961	4	2	6	199	159	358
1962	5	2	7	213*	149	362
1963	6	3	9	220	152	372
1964	7	4	11	228	156	384
1965	9	5	14	235†	160	395
1966	8	5	13	241	163	404
1967	9	6	15	247	167	414
1968	10	7	17	257	172	429
1969	13	8	21	270	177	447
1970	15	8	23	283	182	465
1971	15	11	26	294	189	483
1972	13	16	29	306	202	508
1973	17	16	33	323	215	538
1974	21	23	44	343	234	577
1975	21	23	44	362	254	616
1976	22	23	45	385	272	657
1977	22	27	49	406	299	705
1978	20	19	39	425	324	749
1979	21	22	43	449	350	799
1980	18	26	44	467	379	846
1981	17	21	38	484	404	888
1982	22	23*r*	45*r*	505	434	939
1983	19	30	49	526	467	992

*Change of ownership from private to State of 11 300 hectares.
†Includes 1620 hectares windblown in 1964 but considered salvageable.

NOTE—(1) Private afforestation figures before 1960 are based on incomplete historical data, and considerable estimation has taken place. In previous official statistics a 77 000 ha overestimate of the increase in private stocked forest area during the period 1921–60 was made. This may have been due to the recording of gross productive area instead of net-stocked area.

(2) A stocked hectare is defined as a hectare with at least 150 trees more or less evenly dispersed over it.

(3) In recent years there has been an inconsistency between new planting figures and the net increase in stocked area. The Forest Service's data-base on non-state forests has been building up, and in the process, plantations other than the current year's plantings have been discovered each year and added to the total. It is intended that for the 1984 edition, planting figures for past years will be revised by apportioning discovered plantations to appropriate planting years.

Source: NZFS (1984)

Table: 11

NET PRODUCTIVE STOCKED EXOTIC FOREST AREA AT 31 MARCH 1983
BY SPECIES AND OCCUPIER TYPE

Thousand Hectares

Species	*Forest Service*	*Private Persons*	*Informal Groups Partnerships Estate Trusts and Maori Incorporations*	*Companies*	*Local Authorities*	*Government Departments (non NZFS)*	*Not Known*	*Total*
1	2	3	4	5	6	7	8	9
Radiata pine	412	47	17	340	32	8	2	857
Douglas fir	52	1	—	3	1	—	—	57
Corsican pine	16	—	—	—	—	—	—	17
Eucalyptus	6	1	—	6	—	—	—	14
Other Species	40	3	1	2	2	—	—	47
Total	526	52	19	350	35	8	2	992

NOTE—Owing to rounding, figures do not always add to totals shown.

Source: NZFS (1984)

Table: 11a

STATE EXOTIC FORESTS: PLANTING AND SILVICULTURAL OPERATIONS

Hectares

Year Ended 31 March	New Area Planted	Area Restocked	Pruned	Thinned With yield	Thinned To waste	Clear Felled
1	2	3	4	5	6	7
1941	2 085	..	3 807	1 019		56
1942	1 828	..	1 990	601		68
1943	813	..	1 212	594		54
1944	705	..	1 777	316		59
1945	860	..	2 049	385		112
1946	331	..	2 346	232		95
1947	493	..	3 030	427		167
1948	1 313	..	3 531	504		183
1949	2 079	..	3 631	807		194
1950	2 132	..	3 807	1 068		194
1951	1 657	..	2 890	1 250		235
1952	2 037	..	4 070	1 463		275
1953	2 395	..	4 954	1 785		354
1954	1 983	..	4 897	2 737		412
1955	2 157	..	4 785	2 218		754
1956	2 680	..	4 415	1 843		1 324
1957	2 693	..	6 754	2 174		1 140
1958	3 410	..	5 968	2 729		1 348
1959	2 884	..	4 834	2 704		1 652
1960	2 884	..	6 709	3 314		1 470
1961	3 912	949	7 071	3 201		1 894
1962	4 746	1 551	6 014	3 743		1 712
1963	6 133	2 736	6 407	1 233	2 924	1 907
1964	7 327	2 378	6 903	1 446	3 017	2 263
1965	8 643	2 261	6 307	1 751	3 340	2 213
1966	8 082	2 172	6 737	1 656	2 203	2 028
1967	8 615	2 389	8 800	1 476	3 744	2 563
1968	9 743	3 130	8 805	1 632	5 414	2 599
1969	13 410	3 476	9 108	1 887	4 631	3 254
1970	14 849	2 152	11 403	2 582	4 433	3 997
1971	14 725	3 601	10 656	2 839	5 751	4 405
1972	13 004	4 948	14 303	2 463	8 418	4 548
1973	17 358	4 606	16 016	2 705	13 990	4 663
1974	20 965	5 890	10 953	3 285	9 833	4 692
1975	21 043	6 538	16 369	2 228	18 144	5 183
1976	21 665	7 451	23 956	2 595	21 510	6 584
1977	22 278	6 635	20 410	3 505	18 759	7 678
1978	19 894	7 964	26 225	2 801	24 097	8 183
1979	21 684	10 054	30 679	4 306	30 019	6 669
1980	18 289	8 487	32 042	4 166	29 700	8 220
1981	16 686	9 419	43 206	5 004	34 898	8 198
1982	21 583	9 094	50 416	4 579	32 940	7 293
1983	19 243	9 520	57 616	2 467	42 713	5 118

NOTE—(1) Thinning and pruning began on a small scale in 1929; clear felling in 1939. Details up to 1940 not available.
(2) Clear felling before 1966 includes small areas of felling without yield.
(3) The total volume for thinning with yield was

year	*cubic metres*
1979	566 000
1980	650 000
1981	668 000
1982	532 000
1983	473 000

Source: NZFS (1984)

KEY TO TABLE SUMMARIES OF SILVICULTURAL SCHEDULES

Explanation for each column of the tables is as follows:

Code names

Each schedule is identified by a four letter code name - two letters each for (i) conservancy or private company of origin and (ii) primary objective:

ORIGIN	OBJECTIVE
AU = Auckland	CL = Clearwood
FP = NZ Forest Products Ltd	GP = General purpose
RO = Rotorua	ST = Structural
FL = Fletcher Forests Ltd	MT = Minimum tending
TA = Tasman Pulp and Paper Ltd	PR = Protection
WN = Wellington	PU = Pulpwood
NE = Nelson	RO = Roundwood
WS = Westland	
CA = Canterbury	
SO = Southland	

Sites limited to

S.I.	Site Index - defined as stand Mean Top Height in metres at age 20 years
access	defined by topography and weed problems
stems/ha	stems per hectare

Remaining columns

stems/ha	stems per hectare (residual for thinning, treatment for pruning)
ht	stand height (variously expressed as Predominant Mean Height, Mean Top Height, or Mean Crop Height)
lift	upper limit in metres
age	in years
d.b.h.	in centimetres

Source: Pages 1.5 to 1.10; Williams (1982)

CLEARWOOD SCHEDULES

Code name	Region	Sites limited to	Initial stocking	Thinning		Pruning			Rotation				Growth model	Remarks
				stems/ ha	ht	lift	stems/ ha	ht	age	ht	d.b.h.	stems/ ha		
AU/CL	Kaikohe	S.I.< 27, easy access	1540			(1.8 or	750	6.0)					KGM2	
				800	6.5	(2.4	750	6.5)					or	
						4.0	370	9.0					BEEK	
				225	11.5	5.5/6	225	11.5	25	33	63	225		
	Waitemata	S.I.< 27, easy access	1850	740	7.6	2.4	740	7.6						
						4.8	370	10.0					AGM1	
				235	12.5	6.0	235	12.5	25	32	56	230		
	Thames	S.I.< 28, easy access	1230/	750	3.0									Lower initial stock-
			1850			2.2	750	6.0						ing if natural
					4.0	370	8.3					KGM2		regeneration present
				250	10.3	6.0	250	10.3				(250)	(adjusted)	
	Te Kuiti	S.I.< 27, easy access	1430	740	6.0	2.2	740	6.0						
						4.0	370	8.0					KGM2	
				250	10.0	6.0	250	10.0	25	32	-	250		
RO/CL	Bay of Plenty	S.I.< 27, good form	1300/	600	6.0	2.2	600	6.0						Incl. veneer produc-
			2000			4.0	400	9.0						tion, low initial SPH
				370P*	12.0	6.0	370	12.0	29	39	<45	355	KGM2	with S.O. stock
	Taupo	S.I.< 27, flat topography	1300/	1000	6.0	2.2	500	6.0						Incl. veneer. Low SPH.
			2220			4.0	300	9.0					KGM2	Second thin for
														production.
				300	15.0	5.8	300	12.0	27	43	50	290		
		S.I.< 27, steep topography	1300/	600	6.0	2.2	600	6.0						Incl. veneer
			2220			4.0	375	9.0					KGM2	Low SPH, etc.
				375P	12.0	5.8	375	12.0	29	45	59	345		
	East Coast	S.I.< 27	1540/	600	5.5	2.2	600	5.5						Low SPH, etc.
			1850			4.0	300	9.0					KGM2	
				300	11.0	5.8	300	11.0	-	-	60	(300)		
FP/GP	Kinleith -	Slope < 10°, stocking > 950 SPH		1110		2.1	500	6.5						Incl. veneer
	2 thins			600	21.0	4.2	200	9.5						Both thins with
				350	29.0	6.0	200	12.5	30	40	45	335	NZFP	production
FP/CL	Single thin	Slope < 10°, stocking > 950 SPH		(1700)		2.1	500	6.5						Veneer
						4.2	250	9.5						Production
				350	17.0	6.0	250	12.5	30	40	(55)	345	NZFP	thin
FL/CL	Taupo/E. Coast	Easy access	1000/	500	4.0	2.2	500	4.0						Low initial SPH
			1670			4.2	250	6.0						on grass sites.
				250	11.0	6.2	250	11.0	+	+	+	+	KGM2	Incl. export logs
	Auckland clay	Medium site quality	1500	500	3.0	2.2	500	4.5						+ Market determined
						4.0	300	8.0						
				200P	12.0	6.0	200	12.0	+	+	+	200	KGM2	
		High site quality	1500	750	3.0	1.5	750	4.0						
						2.5	750	5.0						
						4.0	300	8.0					KGM2	Extra pruning lift to
				200P	12.0	6.0	200	12.0	+	+	+	200		control heavy branch-
														ing

* P = Possible production thin

Table: 12

Table: 13

CLEARWOOD SCHEDULES

Code name	Region	Sites limited to	Initial stocking	Thinning stems/ha	Thinning ht	Pruning lift	Pruning stems/ha	Pruning ht	Rotation age	Rotation ht	Rotation d.b.h.	Rotation stems/ha	Growth model	Remarks
WN/CL	Hawkes Bay	High site quality ("Fallback" - finance, and/or labour limiting)	1540 (or	500 750 200/ 250	5.0 3.0) 10.7	2.2 4.0 5.8	500 350 200	5.0 7.9 10.7	21/ 23	33	56	200/ 250	BEEK	(Alternative "Fallback" schedule) Initial SPH varies with S.I.
	Rotoraira (proposed)	S.I. ≮ 27	1250/ 1430	750 200P*	4.5 12.0	2.2 4.0 5.8	400 275 200	5.0 7.5 11.0	21	33	50	200	KGM2	Incl. veneer
	Karioi	S.I. ≮ 27 (altitude ≯ 925 m)	2310	1000 250P	4.5 11.5	2.2 4.0 5.8	500 350 250	5.0 7.5 11.0	24	33	49	250	-	Incl. veneer
	Ngaumu	Slope < 30°, good form and access high quality site	1430	740 250P	5.0 11.5	2.2 4.0 5.8	740 370 250	5.0 8.5 11.5	22	32	-	250	-	
WN/CL	Lismore	Easy access	1540	600 290	6.0 12.0	2.4 4.2 5.8	600 400 290	6.0 9.0 12.0	25	39	49	290	KGM2	
	Manawatu	≮1100 m from coast	1580	800 270	6.0 12.0	2.4 4.2 5.8	800 400 270	6.0 9.0 12.0	22	29	49	270		
	Te Wera		1540	750 250	5.0 11.0	1.8 6.0	750 250	5.0 11.5	25	37	50	250		
NE/CL	Golden Downs	S.I. ≮ 25, easy access	1000	300	(6.0)	2.5 4.8	300 300	(6.0) (11.0)	27	33	47	300	NRAD	Incl. veneer
	Wairau (proposed)	S.I. ≮ 28, altitude ≯ 500 m easy access	1120	500 300	7.5 10.5	3.0 5.3	500 300	7.5 10.5	30	40	53	295	KGM2 (adjusted)	
	Rai	High site quality, easy access	1430	500 300	6.0 13.0	2.5 4.5 6.0	500 350 300	6.0 9.0 12.0	30	35	50	295	NRAD	
		Good stocking also	1430	250	13.0	6.0	250	13.0	35	39	56	245	NRAD	"Fallback" type schedule
	Nelson District	High site quality, easy access	1540	300	5.5	2.4 4.8	300 300	5.5 10.0	27	36	47	300	NRAD	
WS/CL	Westland	Low site quality, difficult access	2310	600 275	6.5 12.0	½HT ≯6	600 275	3.5 12.5	30+	-	-	250	-	Lifts by individual tree ht
		High site quality, easy access	1390/ 2310	600 275P	5.5 12.5	2.4 4.2 6.0	600 275 275	5.5 10.0 12.5	30+	-	-	250	-	High initial SPH on hill country
CA/GP	Foothills		1250/ 1660	600 325P	6.0 11.0	2.5 4.5 6.0	600 325 325	6.0 9.0 11.0	25/ 30	32/37	57/62	265/ 290	BEEK	Structural and framing. High initial SPH on gorse sites
	Plains		1250	900 375P	6.0 11.5	2.5 5.0	375 375	6.0 11.0	30/ 36	28/30	47/48	350/ 400	BEEK	Framing objective. Second thin for production.

* P = Possible production thin

CLEARWOOD SCHEDULES

Code name	Region	Sites limited to	Initial stocking	Thinning		Pruning			Rotation				Growth model	Remarks
				stems/ ha	ht	lift	stems/ ha	ht	age	ht	d.b.h.	stems/ ha		
SO/CL	Southland	Easy access, good form (Tapanui S.I. ≮ 23)	1430	(1000 700 350P	3.5) 6.0 12.0	(1.0 2.0 4.0 6.0	700 700 400 350	5.5) 6.0 9.0 12.0	30	35	55	350	SGM1	Grazing option has extra prune and thin
	Dunedin	S.I. 20-27	1390	740 350	6.0 12.0	1.8 3.6 5.4	740 350 350	6.0 9.0 12.0	30	35	50	350	SGM1	
	Herbert	Difficult access (gorse)	1430	370	12.0	5.5	370	12.0	30	37	49	350	SGM1	Production thin

Table: 14

Table: 15

STRUCTURAL SCHEDULES

Code name	Region	Sites limited to	Initial stocking	Thinning stems/ha	Thinning ht	Pruning lift	Pruning stems/ha	Pruning ht	Rotation age	Rotation ht	Rotation d.b.h.	Rotation stems/ha	Growth model	Remarks
AU/ST	Kaikohe	S.I.< 27 m, difficult access (gorse)	1850/ 2310	370	13	3 lifts on 3 edge tows as for CL schedule			30	30	43	370	KGM2 or BEEK	
	Waitemata	None	1850	370	16	-	-	-	33	34	44	366	AGM1	Pulp production thin
	Thames	S.I.< 28	1230/ 1850	750 370	3 13	-	-	-	-	-	-	370	-	Lower initial SPH if regeneration present
	Te Kuiti	S.I.< 27, difficult access	1430	370P*	15	-	-	-	33	34	-	370	KGM2	
RO/ST	Bay of Plenty	S.I.< 27	1300/ 2000	600	6	2.2	600	6	27	37	38	520	KGM2	2nd thin with production possible
	Taupo	S.I.< 27	1300/ 2220	600	6	2.2	600	6	27	37	38	540	KGM2	2nd thin with production possible
FP/ST	Kinleith	Slope 10-18°; stocking	1670	350	27	-	-	-	30	40	45	340	NZFP	Thin with production
	Matahina	>700	1670	1250 325	3 23	-	-	-	35	43	52	300	-	1st thin for regen. Production thin
	Matakana		1670	350	20	-	-	-	30	39	-	325	-	
FL/ST	(Utility	Steep, difficult access (gorse)	1500	300	8	-	-	-	+	+	-	250	-	+ Market determined
WN/ST	Hawkes Bay	Low site quality "Fallback" schedule for clearwood sites	1540	500/ 750 250	3 10.7	-	-	-	21/	33	56/57	200/ 250	-	Finance and labour limiting
	Kaweka	Very low site quality	1540	600 300	3 10.7	-	-	-	15 24/ 27	28/32	41/50	250/ 300	-	Finance and labour limiting
	Rotoaira	S.I.< 27	1430	375	9	-	-	-	25	33	40	370	KGM2	
	Karioi - high altitude	Altitude ≮925 m P. contorta regen.	2310	1000 375P	4.5 12	2.2	400	5	24	34	42	370	-	
	Ngaumu	Non CL	2000	370P	11.5	-	-	-	27	-	-	370	-	
	Manawatu	300-1100 m from coast	1850/ 2220	1200 270/ 370P	6 12	2.4 4.2	600 270	6 10	23/ 25	25/32	36/45	270/ 370	-	2nd lift low priority and only 800 m from coast
NF/ST	Nelson District	Difficult access (gorse, fern)	1000/ 1540	600/ 700	10/13	-	-	-	27	36	36	500/ 770	NRAD	Thinning after weed suppression
	Golden Downs	S.I.< 25, difficult access (gorse)	800			-	-	-	26/ 28	33	35	650	NRAD	General purpose and pulp
	Wairau - unpruned	S.I.< 28 and/or difficult access	1130	500	15	-	-	-	30	38.5	41	458	KGM2 (adjusted)	Domestic and export sawlogs
	Rai - unpruned	Difficult access (gorse, broom, bracken)	2000	500	13	-	-	-	30	35	42	458	NRAD	
SO/ST	Tapanui	S.I.< 23 m	1430	700	6	2.2 4.0 6.0	700 edge trees only	6 9 12	30/ 35	28/32	45/55	700	SGM1	

*P = Possible production thin

MISCELLANEOUS SCHEDULES

Code name	Region	Sites limited to	Initial stocking	Thinning		Pruning			Rotation				Growth model	Remarks
				stems/ ha	ht	lift	stems/ ha	ht	age	ht	d.b.h.	stems/ ha		
AU/PR	Aupouri	≯300 m from coast	2310	-	-	-	-	-	-	-	-	-		Coastal zone Clearfell when suitable
AU/PU	Waitemata		2310	-	-	-	-	-	≯25	28.3	23.5	1284	AGM1	Pulpwood commitment until 1985
RO/PR	East Coast	Altitude > 600 m <u>or</u> unstable	1540/ 1850	500	11.5	(2.2	?	6)	-	-	45/48	-		Single pruning possible
FP/MT	Tahorakuri	Fire regeneration		400	?	-	-	-	35/ 40	37/42	40/44	400	NZFP	Tractor crush thinned age 15
	Mamaku	S.I. 24-26 m, <u>Armillaria</u>	1670	Biological		-	-	-	25/ 30	28/35	46/52	250/ 300	NZFP	Pulp/sawlogs
TA/PU	Tarawera/ Rotoiti	Slope<10°	1080/ 1500	420P	16.0	-	-	-	23	38	39	400	KGM2 (adjusted)	High initial stocking on <u>Armillaria</u> sites
		Slope≥10°	1850	420	11.0	-	-	-	23	38	40	400	KGM2 (adjusted)	20 to 30-year rotation
WN/PR	Manawatu	≯300 m from coast	2500	1200 500P*	9.0 17.0	-	-	-	35	25/27	33	470/ 500	-	Coastal zone
NE/MT	Rai	Poor stocking, difficult access	1430	-	-	-	-	-	30	35	35/55	250/ 750	NRAD	Untended default schedule. Export logs
CA/PR	Omihi	Nassella tussock	3090	775 275	6.0 9.0	2.5 4.5 6.0	650 275 275	6 9 13	25	-	-	-	-	High initial SPH to suppress tussock
SO/RO	Tapanui	Easy access	2000	350	11.0	2.0 4.0 6.0	600 350 350	5 8 11	25/ 30	28/32	45/55	350	SGM1	Includes clearwood production. Thin for posts
	Southland		1850/ 2000	1200/ 2000	2.5/ 6.0	2.0	≮1000	4.5/ 6	12/ 16	14/15	18/20	1200/ 2000	SGM1	Clearfell for approx. 10 000 posts/ha
SO/MT	Southland		1430	400	≯12.0	2.0	400	≮6.0	-	-	-	-	-	Finance limiting Minimum tending

*P = Possible production thin

Table: 16

Fibreboard plant for Nelson

Four years of negotiations and planning ended in the boardroom of the Transport Nelson Group in Nelson yesterday when a joint agreement for a $45 million medium density fibreboard plant was signed.

The project involves three New Zealand companies — Nelson Pine Forest, Ltd, Odlins and the TNL Group and the Japanese company, Sumitomo Forestry, Ltd.

The plant, to be built adjacent to the chip mill of Nelson Pine Forest on the outskirts of Richmond, is expected to be in production by August, 1986.

As well as using exclusively New Zealand resources (energy, resin and pine softwood chip, which is currently being exported to Japan for craft paper manufacture), it is expected the initial export sales will exceed $25 million annually.

The project will create 54 more jobs in the Nelson area and is expected to stimulate traffic through Port Nelson and bring a greater measure of stability to the vast Nelson forest industry.

In making the announcement, the companies said the new product would be at the premium end of the market and would be complementary to traditionally-produced and thicker medium density fibreboard.

A leading expert and technical consultant, Dr Owen Haylock, of New Zealand, has recommended to the joint venture after a two-year study a recently-developed production process.

The process he recommended takes advantage of the market for thin fibreboard. By using a continuous press capable of producing medium density fibreboard, both thick and thin (between 2.5mm and 33mm), significant economies in production costs can be assured.

The Sumitomo company is the largest and oldest company in the Japanese forest products industry. As well as investing financially in the project, it will help with marketing in Japan. Other target markets are Australia and South East Asia, with 75 per cent of the annual 70,000 cu m produced being exported and the remainder kept for domestic consumption. A production of 200 tonnes a day is anticipated.

The two New Zealand groups, Odlins and TNL, are associated in the operation and marketing of Nelson pine forest woodchips, $12 million worth of which are being exported through Port Nelson annually.

All town planning and environmental issues have been finalised and construction is expected to commence this month.

Source: The Press 3rd October 1984

Logging to end

PA Wellington

Logging of native timber from the Whirinaki forest was likely to end within three months, said the Minister for the Environment, Mr Marshall, yesterday.

Mr Marshall said, however, that before a date to end logging was set, a Government caucus committee would visit Minginui to discuss with the local community how a change-over would take place.

Sawmill employment at Minginui would be safeguarded by using exotic timber from State forests, Mr Marshall said.

Mr Marshall and the Minister of Forests, Mr Wetere, plan to ask the Cabinet to stop logging in the forest as soon as practicable. The timing depended on some technical changes being made and existing contractual obligations being met, said Mr Marshall.

"It is hoped that all logging of native timber in the Whirinaki forest will cease before the end of 1984," he said.

Source: The Press 5th October 1984

There is a pocket on this page to insert a pamphlet, the scan of which is located at the back of this thesis.

SELECTED NORTH AMERICAN TIMBER SPECIES

The characteristics of the species for which timber price data is presented, are outlined below. These are those that will provide the most competition for radiata pine clearwood in Pacific Rim networks. For example Douglas fir and western hemlock are the main coniferous species imported by Australia and Japan from North America. The characteristics of southern pine timber are also outlined as the prices paid for this timber are also presented.

Information for the following outline is drawn from the Canadian lumber grading manual and the USDA 1974 publication "Wood Handbook".

Ponderosa pine (*Pinus ponderosa*)

The wood varies in colour. Mature trees have a very thick sapwood which is pale yellow. The heartwood is light reddish brown. The sapwood yields a very fine quality timber, light in weight, fairly soft, moderately low in strength and uniform in texture. The heartwood in large old trees is considerably heavier than the sapwood.

The wood works easily and smoothly without spliting and splintering. It takes paints, stains and varnishes well, and seasons readily. It has good nail holding properties and is used extensively for containers.

Douglas fir (Pseudotsuga menziesii)

The wood varies in character and grain depending upon the environment in which the tree grew. On the coast growth is much faster, which results in hard coarse grained wood which is usually of a reddish brown colour. Very narrow-ringed wood of old trees may be yellowish brown and is known on the local market as yellow fir.

Second growth trees may contain a much higher proportion of sapwood and are thus of a lower quality than old growth wood. The wood of both crops varies widely in weight and strength, with the density of the wood being the indicator of strength.

Douglas fir timber is used mostly for building and construction purposes. Considerable quantities also go into cooperage stock, mine-timbers, poles and fencing. Small amounts are used for floor, furniture, ship and boat construction, wood pipes and tanks.

Western larch (Larix occidentalis)

The heartwood of western larch is yellowish brown and the sapwood yellowish white.

The wood is hard and strong and in these respects it resembles Douglas fir closely which accounts for it often being marketed with Douglas fir. Knots are common, but small and tight.

Western larch is used mainly in building construction for rough dimension small timber, planks and boards. It is also used for railway ties and posts and poles. Some high quality grade material is manufactured into interior finish, flooring sash and doors.

Western hemlock (Tsuga heterophylla)

The heartwood and sapwood of western hemlock are almost white with a purplish tinge and is practically free of resin. The wood contains small sound black knots that are usually sound and stay in place. Its uniform texture provides an easy wearing surface for uses where this characteristic is important.

Western hemlock is moderately light in weight and moderate in strength. Uses are mainly as pulpwood, construction timber and plywood. The timber is largely used in uses that are not demanding of strength. Small amounts are used in furniture.

Firs, true (Western species)

This is comprised of six commercial species: alpine fir (Abies lasiocarpa), California red fir (A. magnifica), grand fir (A. grandis), noble fir (A. procera), Pacific silver fir (A. amubilis) and white fir (A. concolour).

The wood of the western firs is light on weight and is soft and light in colour. Timber cuts goes principally into building construction, boxes and crates, planer-mill products, sash, doors and general mill products.

In general western firs are quite suitable for all the purposes for which western hemlock is put and is often marketed with it. Western hemlock is more superior for exacting uses such as interior finishing, flooring etc.

Southern pine

There are a number of species included in the group marketed as southern pine timber. The most important are:

longleaf pine (*Pinus pulustris*), shortleaf pine (*P. echinata*), loblolly pine (*P. taeda*) and slash pine (*P. elliottii*).

Timber from any one or a mixture is classified as southern pine by grading standards.

The wood of the various southern pines is quite similar in appearance. The sapwood is yellowish white and the heartwood reddish brown. The sapwood is wide in second growth stands and the heartwood begins to form when the tree is about 20 years old.

As the wood varies in density between species a density rule has been written that specifies certain visual charactertistics for structural timbers. Dense southern pine is used extensively in construction work. Timber of lower density and strength has uses such as interior finishes, sheathing, sub-flooring, pallets etc. The wood is also used extensively for structural grade plywood.

Table:17

PERCENTAGE RECOVERY OF SEVERAL WEST
COAST LUMBER GRADES

Species	Old growth (g)	Second growth (g)
UTILITY AND ECONOMY GRADES		
Douglas fir	20	10
Hem-fir	25	15
MOULDING AND SELECT GRADES		
Douglas fir	20	3
Ponderosa pine	25	3

Source: from Fahey & Starostovic, 1979.

SUMMARY OF THE WESTERN LUMBER GRADING RULES FOR DOUGLAS FIR

Source: Sutton (1975)

NOTE: Douglas fir can also be graded under West Coast or British Columbian rules but these are similar to those for Western Lumber.

The Western Lumber grading rule (WWPA, 1972) are common to a wide range of species - Douglas fir, Engelmann spruce, Hemlock (*Tsuga* sp.), The pines (*Pinus ponderosa*, *P. contorta*, *P. lambertiana*, *P. monticola*, Firs (*Abies* sp.) Cedar, Larch etc.

Although well over 100 grades are listed in the rules many have only limited applications. Lumber is normally graded within one of four major groupings:

1. Select and finish
2. Factory or shop
3. Boards
4. Dimension

SELECT AND FINISH

These are the most valuable grades which must provide an excellent surface for any kind of finish used in panelling, moulding, cabinet work etc. Always graded on better face - the reverse face can be of lower grade.

There are 3 major select grades.

B & Btr (1 & 2 clears)
Highest grade with many pieces absolutely clear, knots limited to 2 (per 8" x 1" x 12 ft), sound, 'tight' and not larger than 1/2" diam. Resin or bark pocket limited to one 1/16" wide and 3" long (or 1/8" wide and 2" long).

C Select
(Often mixed with B & Btr and sold as C & Btr - as such one of the most sought after products from the clear portion of the log).
Knots limited to 2 (per 8" x 1" x 12 ft) sound, 'tight' and not larger than 3/4". Resin or bark pockets limited to twice the allowance for B & Btr.

D Select
A lower grade but still with excellent finishing properties. Knots limited to 2 (per 8" x 1" x 12 ft) sound, 'fixed' and not larger than 3/4". Resin or pocket limited to four times the B & Btr allowance.

(NOTE: A 'tight' knot is defined as one so fixed by growth, shape or position that it retains its place in the piece - it may be intergrown or tight encased. A 'fixed' knot is defined as one which will retain its place in dry lumber under ordinary conditions but can be moved under pressed though it is not easily pushed out.)

There are other grades in this group. They include: finish grades, flooring, panelling, siding, lath stepping batterns, gutter etc.

FACTORY GRADES

Lumber intended for remanufacture into items such as doors, windows, mouldings, furniture etc. It is usually sold in sizes thicker than 1". The more important grades are moulding and shop lumber.

Moulding Stock

One grade in which each piece must be of a quality suitable for ripping into clear strips one inch or wider and 10ft or longer. At least 2/3 vols of the area to contain such rips. Up to 10% of the footage may be 6-9 ft.

Shop Lumber

There are four grades which are grades with reference to the lumber's use for doors, sashes, etc. Very often wanted in thickness 1 1/4" or more. Always graded on the poorer face. The grades are:

Factory Select (No. 3 clear)
Each piece to contain 70% or more No. 1 door cuttings (ie. lengths 6'8" - 7'7" clear both sides)

No. 1 Shop
Each piece to contain 50-70% No. 1 door cuttings.

No. 2 Shop
To contain 25% No. 1 door cuttings of 33 1/3% No. 1 and 2 door cuttings (ie. lengths 6'8" - 7'7" nearly clear but admitting minor defects such as small checks and sound knots not exceeding 5/8" diam) or 40% No. 2 door cuttings.

No. 3 Shop
More than 50% of the area must be available for cutting into pieces suitable for doors, sashes, jambs, sills etc. Some of these may have minor defects as allowed in No. 2 door cutting as defined above.

The above rules apply to sizes 1 1/4 or thicker but similar tules apply to 1" stock. There are also other factory grades eg. Box Lumber, Pencil Stock, Door Stock, Cuttings etc.

BOARD GRADES

The knotting grades for use in construction, walls, shelving, siding, sheathing, crates etc. There are 5 grades;

1 Common - a knotting grade of fine appearance (rarely available in Douglas fir)

2 Common - used in panelling, shelving etc. Knots such that they can be painted for interior or exterior use.

3 Common - for building, fences, boxes, crates etc.

4 Common - for subfloors, roof and wall sheathing concrete forms, and low cost fencing, crates etc.

5 Common - poorest board grade - used where neither strength nor appearance are basic requirements.

Grading rules for each grade are comprehensive but limitations on knot size and condition are the major restructions. Allowances for the 5 grdes are compared for 4", 8" and 12" wide boards in table G1.

DIMENSION GRADES

Whole range of grades depending on size and possible end use. The major divisions of rules:

1. Light Framing - for sizes 2 x 2 to 4 x 4 (includes grades construction, standard, utility and economy).
2. Structural Light Framing - also for sizes 2 x 2 to 4 x 4 (grades select structural, No. 1, No. 2, No. 3 and economy).
3. Structural joists and planks - for thickness 2 to 4", 6" and wider (grades as in 2).

Despite the fact that light framing grades are only supposed to apply to sizes up to 4" wide some publications quote grade out-turns for sizes up to 12" wide.

The rules for Light Framing and Structural Light Framing are similar (see Table G2). The main differences are that the structural grade have additional restrictions on the size of edge knots, and that the wood must have more than 4 rings per inch - but in Douglas fir (and larch) there can be fewer rings if the latewood averages more than a third. If Douglas fir lumber has more than 6 rings per inch the Structural Light Framing grades may be classified as "Dense".

The rule can be defined by the allowance of knot size, condition and position. Maximums for 4 x 2 sizes (in practice 1 1/2" x 3 1/2" surfaced dry) for each grade are given in Table G2.

TABLE G1

LIMITING KNOT SIZES IN COMMON GRADES

Grade	Face Width	MAXIMUM SIZE (IN INS.) OF KNOTS ALLOWED Red Knots	Black Knots	Unsound Knots
1 Common	4"	1 1/4"	3/4	NA
	8"	2 1/4	3/4	NA
	12"	2 3/4	3/4	NA
2 Common	4"	2	3/4) only 1	NA
	8"	3	1 1/4) per 16 ft	NA
	12"	3 3/4	1 1/2) length	NA
3 Common	4"	2 1/2	1 3/4) only 2	3/4) only 1
	8"	3 1/2	2 1/4) per 12 ft	1 1/2) per 16 ft
	12"	4 1/2	3) length	2 1/4) length
4 Common	4"	3	3	1 1/2) only 3
	8"	5 1/4	5 1/4	2 1/2) per 12 ft
	12"	8	8	3 1/2) length
5 Common		NR	NR	NR

NOTES: Red knot = intergrown knot (must be sound, tight and smooth)
Black knot = bark encased knot (must be sound, tight and smooth)
Unsound knots = loose knots (incl. sound knots which may become loose) holes etc.

NA = not allowed
NR = not restricted

TABLE G2

LIMITING KNOTS IN DIMENSION GRADES

(4 x 2 size only)

Grade	Spike Knots (max cross-sectional area)	ALLOWED MINIMUM KNOT SIZE (IN INS.) ON WIDE SURFACE Encased but sound and firm		Unsound or loose knots, holes
LIGHT FRAMING:				
Construction	1/4	1 1/2		1 (only 1 per 3 ft)
Standard	1/3	2		1 1/4 (only 1 per 2 ft)
Utility	1/2	2 1/2		1 1/2 (only 1 per 1 ft)
Economy	NR	NR		NR
STRUCTURAL LIGHT FRAMING:		At Edge	Centre-line	
Select Structural		3/4	7/8	3/4 (only 1 per 4 ft)
No. 1		1	1 1/2	1 (only 1 per 3 ft)
No. 2		1 1/4	2	1 1/4 (only 1 per 2 ft)
No. 3		1 3/4	2 1/2	1 3/4 (only 1 per 1 ft)
Economy	NR	NR	NR	

NR = not restricted

In the structural grades design values are assigned to all grades except Economy. For each grade the strength assigned is obtained by assuming that the fibre stress in bending for the grade will be given percentage of that allowed for clear stright-grained wood. The design value for stiffness is obtained by assuming a given percentage of the modulus of elasticity of that allowed for clears. The assumed percentage and actual (for Douglas fir) design values are:

	EXTREME FIBRE STRESS IN BENDING		MODULUS OF ELASTICITY	
Grade	% of Clear Value	Design Value*	%	Design Value
Select Structural	67%	2100	100	1,800,000
No. 1	55%	1750	100	1,800,000
No. 2	45%	1450	90	1,700,000
No. 3	26%	800	80	1,500,000

* recommended design value for a single member in pounds per square inch

Major uses of dimension grades:

Structural Light Framing.

Select Structural & No. 1 for use where both high strength and appearance required.

No. 2 & No. 3 - for general construction where appearance may not be so important.

Light Framing - construction and standard for general framing etc.

Utility - for studs, plates, bracing, rafters etc.

Economy - an economical grade for use where neither strength nor appearance is important.

5 GROUP IV TIMBERS: CORSICAN PINE, LOBLOLLY PINE, LODGEPOLE PINE, LONG LEAF PINE, RADIATA PINE

5.1 Finishing grade

5.1.1 *General*

5.1.1.1 Finishing grade shall be a board grade composed of timber that is suitable on one face and one edge for natural finish.

5.1.2 *Permitted defects*

5.1.2.1 The following defects shall be permitted on the best face and edge:

Checks:		
Knot checks . .		1 mm wide
Surface checks . .	(a)	0.5 mm wide
	(b)	50 mm long
Knots:		
Intergrown knots other than spike knots . .	(a)	75 mm (singly)
	(b)	sum of sizes in any group half of the width
Intergrown sound spike knots . .	(a)	40 mm wide
	(b)	projected length one third of the width of the piece
Sloping grain		not restricted
Stain		insufficient to impair natural finish
Warp:		
Bow		as given by table 2
Crook		as given by table 3
Cup		as given by table 4
Twist		as given by table 5

4.7

5.2 **Dressing grade**

5.2.1 *General*

5.2.1.1 Dressing grade shall be a board grade that is suitable on one face and one edge for natural finish.

5.2.2 *Permitted defects*

5.2.2.1 The following defects shall be permitted on the better face and edge:

Bark or resin pockets	(a)	3 mm wide
	(b)	sum of lengths 300 mm for 4.8 m long piece and proportional amounts for pieces of other lengths
Checks:		
Knot checks		1 mm wide
Surface checks . .	(a)	1 mm wide
	(b)	100 mm long
Cross grain		not restricted
Holes, loose knots, decayed knots . .	(a)	15 mm
	(b)	two in any piece
	(c)	only in 10 percent of pieces in consignment
Knots:		
Intergrown knots other than spike knots . .	(a)	100 mm (singly)
	(b)	sum of sizes in any group half of the width
Partially intergrown knots other than spike knots	(a)	75 mm
	(b)	sum of sizes in any group one-third of the width of piece
Tight encased knots	(a)	15 mm
	(b)	two in any piece up to 3.6 m long; three in any piece exceeding 3.6 m long

Intergrown sound spike knots . .	(a)	50 mm wide
	(b)	projected length half of the width of the piece
Intergrown sound double spike knots	(a)	only in pieces of Corsican pine that do not exceed 100 mm wide;
	(b)	25 mm wide
	(c)	projected length two-thirds of the width of the piece
Plugged holes or other plugged defects . .		not restricted, subject to clause 1.3.11
Sloping grain		not restricted
Stain		insufficient to impair a natural finish
Warp:		
Bow		as given by table 2
Crook		as given by table 3
Cup		as given by table 4
Twist		as given by table 5

5.2.2.2 In accordance with clause 1.3.2, the reverse face or edge may contain the defects permitted by clause 5.4.2.1 for Merchantable grade, except as follows:

(a) Pith – 6 mm wide, length unrestricted.

(b) Wane – 10 mm wide on the reverse face; one-quarter of the thickness on the reverse edge.

4.8

5.3 Factory grade

5.3.1 Factory grade shall be a board grade capable of yielding clear cuttings.

5.3.2 Each clear cutting shall be not less than 600 mm long and shall be free from defects on both faces and both edges, except that cup as given by table 4 shall be permitted.

5.3.3 Each piece shall yield not less than 50 percent of its length in clear cuttings with a minimum total of 1.8 m of clear cuttings from any piece. For determination of grade, cuttings shall be tallied only in complete increments of 300 mm.

5.3.4 There shall be no limitation on defects in the sections between clear cuttings.

5.4 Merchantable grade

5.4.1 *General*

5.4.1.1 Merchantable grade shall be a board grade that is suitable for covered surfaces.

5.4.2 *Permitted defects*

5.4.2.1 The following defects shall be permitted on the better face and edge:

Bark or resin pockets	6 mm wide, except that where it is part of a hole, loose knot, or decayed knot, the pocket shall be measured with that hole or knot
Check:	
Knot checks	not restricted
Surface checks . .	100 mm long
Cross grain	not restricted
Holes, loose knots, and decayed knots . .	(a) 20 mm: number not restricted (b) 40 mm (exceeding 20 mm): (1) in pieces exceeding 150 mm wide only (2) not less than 600 mm apart (3) 2 per 1.8 m of length
Knots:	
Intergrown knots other than spike knots (singly or in groups)	(a) 100 mm (singly) (b) sum of sizes in any group half of the width of piece
Partially intergrown knots other than spike knots (singly or in groups)	(a) 75 mm (singly) (b) sum of sizes in any group half of the width

4.9

Tight encased knots	(a)	20 mm: number not restricted
	(b)	one-third of the width or 75 mm, whichever is less (but exceeding 20 mm): (1) not less than 300 mm apart (2) 2 per 1.8 m of length
Sound spike knots and sound double spike knots, inter-grown or partially intergrown	(a)	50 mm wide
	(b)	projected length two-thirds of the width of the piece
	(c)	one per 1.8 m of length
Pith	(a)	12 mm wide
	(b)	10 percent of length
Plugged holes and other plugged defects . .		not restricted subject to clause 1.3.10
Sloping grain		not restricted
Stain		insufficient to impair a natural finish
Warp:		
Bow		as given by table 2
Crook		as given by table 3
Cup		as given by table 4
Twist		as given by table 5

5.4.2.2 The reverse face or edge may contain any defects except as follows:

(a) Pith – (1) 6 mm wide: length unrestricted.
(2) 12 mm wide (exceeding 6 mm wide) – 1.8 m long.

(b) Wane – 20 mm wide on the reverse face; one-third of the thickness on the reverse edge.

5.5 No. 1 Framing grade

5.5.1 *General*

5.5.1.1 No. 1 Framing grade shall be a framing grade comprised of timber suitable for framing and general utility purposes in buildings.

5.5.2 *Permitted defects*

5.5.2.1 The following defects shall be permitted subject to clause 5.5.2.2:

Bark or resin pockets		20 mm wide by 200 mm long or equivalent area
Checks		not restricted
Holes and all knots other than spike knots	(a)	in pieces not exceeding 150 mm wide: one-third of the cross section
	(b)	in pieces exceeding 150 mm wide: one-quarter of the cross section
Spike knots and double spike knots		one-quarter of the cross section
Pith		12 mm wide in pieces of the following sizes only:
	(a)	width not exceeding 100 mm and thickness not exceeding 50 mm provided edges are free of pith for at least 75 percent of their length
	(b)	width not less than 125 mm and thickness not less than 75 mm
	(c)	width not less than 200 mm and thickness not exceeding 50 mm provided pith is contained in the middle third of the width
Sloping grain		1 in 6
Stain		insufficient to obscure the grain
Wane	(a)	one-quarter of the width on the face
	(b)	one-quarter of the thickness on the edge

4.10

Warp:

Bow	as given by table 2
Crook	as given by table 3
Cup	not restricted
Twist	as given by table 5

5.5.2.2 Combinations of defects shall be limited as follows:

(a) In pieces not exceeding 150 mm wide: one-third of the cross section.

(b) In pieces exceeding 150 mm wide: one-quarter of the cross section.

5.6 No. 2 Framing grade

5.6.1 *General*

5.6.1.1 No. 2 Framing grade shall be a framing grade comprised of timber suitable for a limited range of framing and general utility uses in building.

5.6.2 *Permitted defects*

5.6.2.1 The following defects shall be permitted subject to clause 5.6.2.2:

Bark or resin pockets	(a) on the face: 25 mm wide by 300 mm long or equivalent area (b) on the edge: 20 mm wide by 200 mm long or equivalent area
Checks	not restricted
Holes and all knots other than spike knots	(a) in pieces not exceeding 150 mm wide: one-half of the cross section (b) in pieces exceeding 150 mm wide: one-third of the cross section
Spike knots and double spike knots	one-third of the cross section
Pith	not restricted provided that edges are free of pith for at least 75 percent of their length
Sloping grain	1 in 6
Stain	insufficient to obscure the grain
Wane	(a) one-quarter of the width on the face (b) one-quarter of the thickness on the edge

Warp:

Bow	as given by table 2
Crook	as given by table 3
Cup	not restricted
Twist	as given by table 5

4.11

5.6.2.2 Combinations of defects shall be limited as follows:

(a) In pieces not exceeding 150 mm wide: one-half of the cross section.

(b) In pieces exceeding 150 mm wide: one-third of the cross section.

5.7 Engineering grade

5.7.1 *General*

5.7.1.1 Engineering grade shall be comprised of specially selected timber for use in designed timber construction as distinct from light timber frame construction for which specific design is not required. The permitted defects are limited with the intention of ensuring that each piece can be assigned the basic working stresses and moduli of elasticity given by NZS 3603* for the appropriate species and condition.

5.7.2 *Permitted defects*

5.7.2.1 The following defects shall be permitted provided that within any length of the piece equal to its width defects occurring in combination shall be limited so that their cumulative effect does not exceed the effect of a single defect of the maximum size permitted:

Bark or resin pockets	15 mm wide by 150 mm long or equivalent area
Checks	600 mm long
Holes	to the same extent as knots
Knots (including loose, decayed, intergrown, partially intergrown, and tight encased knots):	
Arris knots	(a) on the face: as for margin knots (b) on the edge: as for edge knots
Central face knots	three-tenths of the width
Edge knots	one-third of the thickness
Knot groups	two-fifths of the width provided that the sum of the sizes of all knots intersected by one line drawn at right angles to the length does not exceed three-tenths of the width
Margin knots . . .	one-fifth of the width
Spike knots and double spike knots	one-sixth of the cross section

* *See* list of related documents.

4.12

Sloping grain	1 in 10
Stain	insufficient to obscure the grain
Wane	(a) 50 mm or one-quarter of the width, whichever is the lesser, on the face
	(b) 50 mm or one-quarter of the thickness, whichever is the lesser, on the edge
Warp:	
Bow	as given by table 2
Crook	as given by table 3
Cup	not restricted
Twist	as given by table 5

5.7.3 *Branding*

5.7.3.1 Each piece of Engineering grade shall be legibly branded on a face at one end of the piece and in letters not less than 10 mm high with "NZS 3631E" provided that by agreement between vendor and purchaser the brand may be omitted.

5.8 Box grade

5.8.1 Box grade shall be a grade suitable in the full length as supplied for uses other than finishing, framing, or engineering.

5.8.2 Any number or combination of defects shall be permitted provided that the piece shall hold together in the course of normal handling.

4.13

WESTERN WOOD PRODUCTS ASSOCIATION TIMBER GRADES

See the summary of grades (Sutton, 1975) in Appendix 4 for an explanation of the timber grades. Although this summary is for Douglas fir timber, the terms used and the major grouping of grades are similar for each timber species mix.

The notes below are to accompany the following outline of the grades listed for Douglas fir/western larch, western hemlock/fir and ponderosa pine.

Notes

All the figures are in inches unless specifically stated otherwise.

4/4, 5/4, 6/4 and 8/4 refer to the thickness of the grade.

4/4 = 1 inch

5/4 = 1 1/4 inch etc.

#	=	number
THKR	=	thicker
BTR	=	better
STRUCT	=	structural
RGH/SURF	=	rough surface
D/S	=	dry timber (seasoned)
G/S	=	green timber
4"	=	width of the grade in inches

Example

4/4 #2 α BTR COMMON 4"

This is a one (4/4) times four (4") inch board of number two (#2) and better (BTR) common quality.

Grades selected

From the outlined timber grades listed by WWPA the following grades were chosen for each timber mix. Also shown below are the grades chosen from the listed southern pine timber grade in the Random Lengths yearbook.

Douglas fir/larch

(i) Select and finish

4/4 C α BTR, 4/4 D α BTR

These are the equivalent grades that Whiteside (1982) modelled radiata pine No 1 α 2 clears on.

(ii) Factory or shop

5/4 #1 SHOP

This is because radiata pine factory grades (NZS 3631) permit minimal defects which would be the equivalent of a #1 shop grade in this grouping.

(iii) Boards

4/4 #3 α BTR COMMON, 4/4 #5 COMMON

These two grades would be equivalent to the top and bottom grades of radiata pine merchantable (NZS 3631).

(iv) Dimension

STUD GRADE

A stud grade was chosen as this is a common structural timber in both New Zealand and the USA (dimensions are nominal).

Ponderosa pine

(i) Select and finish

4/4 C α BTR 6", 4/4 D 6"

Same reason as for Douglas fir/larch. The 6 inch dimension was chosen as this would be close to that sawn from a pruned radiata pine log. The prices did not differ much for a 6 or 8 inch board of this grade in any case.

(ii) Factory or shop

5/4 #1 SHOP

Same reason as for Douglas fir/larch.

(iii) Boards

4/4 #3 COMMON 6", 4/4 #5 COMMON

Same reason as for Douglas fir/larch.

(iv) Dimension

STUD GRADE

Same reason as for Douglas fir/larch.

Hemlock/fir

(i) Select and finish

No prices are quoted for select and finishing grades in the month summaries.

(ii) Factory or shop

5/4 MOULDING α BTR

Chosen to represent the highest grade available in this timber group and thus gain an indication of prices paid for long clears.

5/4 α THKR #1 SHOP

Same reasons as for Douglas fir/larch.

(iii) Boards

5/5 #3 α BTR COMMON, 4/4 #4 COMMON

Same reason as for Douglas fir/larch. A number 4 common was the lowest grade common listed.

(iv) Dimension

#2 α BTR 6"

Chosen as it had a very similar price as a stud grade.

Southern pine

(i) Select and finish

1 x 6 C α BTR

This is the only select grade listed in the Random Length yearbook.

(ii) Factory or shop

No grades in this grouping were listed.

(iii) Boards

1 x 6 #2 α BTR RANDOM, 1 x 6 #3 RANDOM

A random grade is equivalent to the WWPA's common grades. Number 2 and 3 are the only board grades listed.

(iv) Dimension

2 x 4 #1 RANDOM

This is chosen to approximate a stud grade.

DOUGLAS FIR/LARCH WWPA TIMBER GRADES

SELECTS DRY RGH/SURF
- 4/4 C & BTR
- 5/4 & THKR C & BTR
- 4/4 D & BTR
- 5/4 & THKR D & BTR

MOULDING (D/S)
- 4/4 MOULDING
- 5/4 & THKR MOULDING
- 5/4 & THKR MOULDING & BTR

MOULDING (D/R)
- 5/4 & THKR MOULDING & BTR

SHOP DRY RGH/SURF
- 5/4 & THKR FACTORY SELECT
- 5/4 & THKR #1 SHOP
- 5/4 & THKR #2 SHOP
- 5/4 & THKR #3 SHOP

COMMONS (D/S)
- 4/4 #3 & BTR COMMON
- 4/4 #4 & BTR COMMON
- 4/4 #4 COMMON
- 4/4 #5 COMMON

DIMENSION 2" (D/S)
- 1 4"
- STANDARD & BTR 4"
- UTILITY 4"
- SELECT STRUCT 6" & WIDER
- #2 & BTR 6"
- #2 & BTR 8"
- #2 & BTR 10"
- #2 & BTR 12"
- #3 6"
- #3 8" & WIDER
- ECONOMY
- STANDARD & BTR STUDS
- STUD GRADE
- ECONOMY STUDS
- LAMINATING STOCK 6"
- LAMINATING STOCK 8"
- LAMINATING STOCK 10"

DIMENSION 2" (G/S)
- #1 4"
- STANDARD & BTR 4"
- UTILITY 4"
- SELECT STRUCT 6" & WIDER
- #1 6" & WIDER
- #2 & BTR 6"
- #2 & BTR 8"
- #2 & BTR 10"
- #2 & BTR 12"
- #3 6"
- #3 8" & WIDER
- ECONOMY
- STANDARD & BTR STUDS
- STUD GRADE
- UTILITY & BTR STUDS
- ECONOMY STUDS

TIMBERS & PLANKS
- #1
- #2 & BTR
- #3
- ECONOMY

PONDEROSA PINE WWPA TIMBER GRADES

SELECTS DRY RGH/SURF
4/4 C & BTR 4"
4/4 C & BTR 6"
4/4 C & BTR 8"
4/4 C & BTR 10"
4/4 C & BTR 12"
5/4 C & BTR
6/4 C & BTR
8/4 C & BTR
4/4 D 4"
4/4 D 6"
4/4 D 8"
4/4 D 10"
4/4 D 12"
5/4 D
6/4 D
8/4 D

MOULDING (D/S)
5/4 MOULDING & BTR
6/4 MOULDING & BTR
4/4 MOULDING STOCK
5/4 MOULDING STOCK
6/4 MOULDING STOCK

MOULDING (D/R)
5/4 MOULDING & BTR
6/4 MOULDING & BTR
5/4 MOULDING STOCK
6/4 MOULDING STOCK

SHOP DRY RGH/SURF
4/4 3 CLEAR
5/4 & 6/4 3 CLEAR
4/4 #1 SHOP
5/4 #1 SHOP
6/4 #1 SHOP
8/4 #1 SHOP
4/4 #2 SHOP
5/4 #2 SHOP
6/4 #2 SHOP
8/4 #2 SHOP
5/4 #3 SHOP
6/4 #3 SHOP
8/4 #3 SHOP
STAINED SHOP
4/4 SHOP OUTS
5/4 THKR SHOP OUTS

COMMONS (D/S)
4/4 #2 & BTR COMMON 4"
4/4 #2 & BTR COMMON 6"
4/4 #2 & BTR COMMON 8"
4/4 #2 & BTR COMMON 10"
4/4 #2 & BTR COMMON 12"
4/4 #3 COMMON 4"
4/4 #3 COMMON 6"
4/4 #3 COMMON 8"
4/4 #3 COMMON 10"
4/4 #3 COMMON 12"
4/4 #4 COMMON 4"
4/4 #4 COMMON 6"
4/4 #4 COMMON 8"
4/4 #4 COMMON 10"
4/4 #4 COMMON 12"
4/4 #5 COMMON
5/4 #3 COMMON
5/4 #4 COMMON
5/4 & THKR 5 COMMON
6/4 #2 & BTR COMMON
6/4 #3 COMMON
6/4 #4 COMMON
BOX (INCLUDES ROUGH)

PATTERNS (D/S)
4/4 #3 COMMON 8" PATTERN
4/4 #2 & BTR COM 8" PATT

RESAWN (D/S)
6/4 #3 COMMON 8"
6/4 #3 COMMON 10"
6/4 #3 COMMON 12"
6/4 #4 COMMON 8"
6/4 #4 COMMON 10"
6/4 #4 COMMON 12"

DIMENSION 2" (D/S)
SELECT DECKING 6"
STANDARD & BTR 4"
#2 & BTR 6"
#2 & BTR 8"
#2 & BTR 10"
#2 & BTR 12"
UTILITY 4"
#3 6" & WIDER
ECONOMY
STUD GRADE

HEMLOCK/FIR WWPA TIMBER GRADES

SELECTS DRY RGH/SURF
- 5/4 MOULDING & BTR
- 6/4 MOULDING & BTR

SHOP DRY RGH/SURF
- 5/4 & THKR 1 SHOP
- 5/4 #2 SHOP
- 5/4 #3 SHOP
- 5/4 & THKR SHOP OUTS
- 6/4 #2 SHOP
- 6/4 #3 SHOP

COMMONS (D/S)
- 4/4 #3 & BTR COMMON
- 4/4 #4 COMMON

RESAWN (D/S)
- 6/4 #4 COMMON 12"

DIMENSION 2" (D/S)
- STANDARD & BTR 4"
- UTILITY 4"
- #2 & BTR 6"
- #2 & BTR 8"
- #2 & BTR 10"
- #2 & BTR 12"
- #3 6"
- #3 8" & WIDER
- ECONOMY
- STANDARD & BTR STUDS
- STUD GRADE
- ECONOMY STUDS

STRUCT LIGHT FRAMING
- 2X4 SELECT STRUCTURAL

COMMONS (G/S)
- 1X6 STANDARD & BTR

DIMENSION 2" (G/S)
- STANDARD & BTR 4"
- UTILITY 4"
- ECONOMY 4"
- #2 & BTR 6"
- #2 & BTR 10"
- #3 6"
- STUD GRADE

Table 18: Douglas fir/larch timber prices (US$/m^3)

Year	Select (1)	(2)	Shop (3)	Boards (4)	(5)	Dimension (6)
1972	108	94	86	41	18	50
1973	159	141	114	64	31	57
1974	211	180	103	64	26	50
1975	181	132	92	43	14	53
1976	202	148	132	53	19	66
1977	229	171	142	61	24	81
1978	285	229	164	72	35	92
1979	340	297	182	83	35	84
1980	331	290	164	78	31	73
1981	329	233	175	75	32	69
1982	263	157	139	68	26	59
1983	296	204	195	79	30	86

(1) 4/4 X α BTR

(2) 4/4 D α BTR

(3) 5/4 α THKR #1 SHOP

(4) 4/4 #3 α BTR COMMON

(5) 4/4 #5 COMMON

(6) STUD GRADE

DOUGLAS FIR / LARCH TIMBER PRICE INDEX (1972=100)

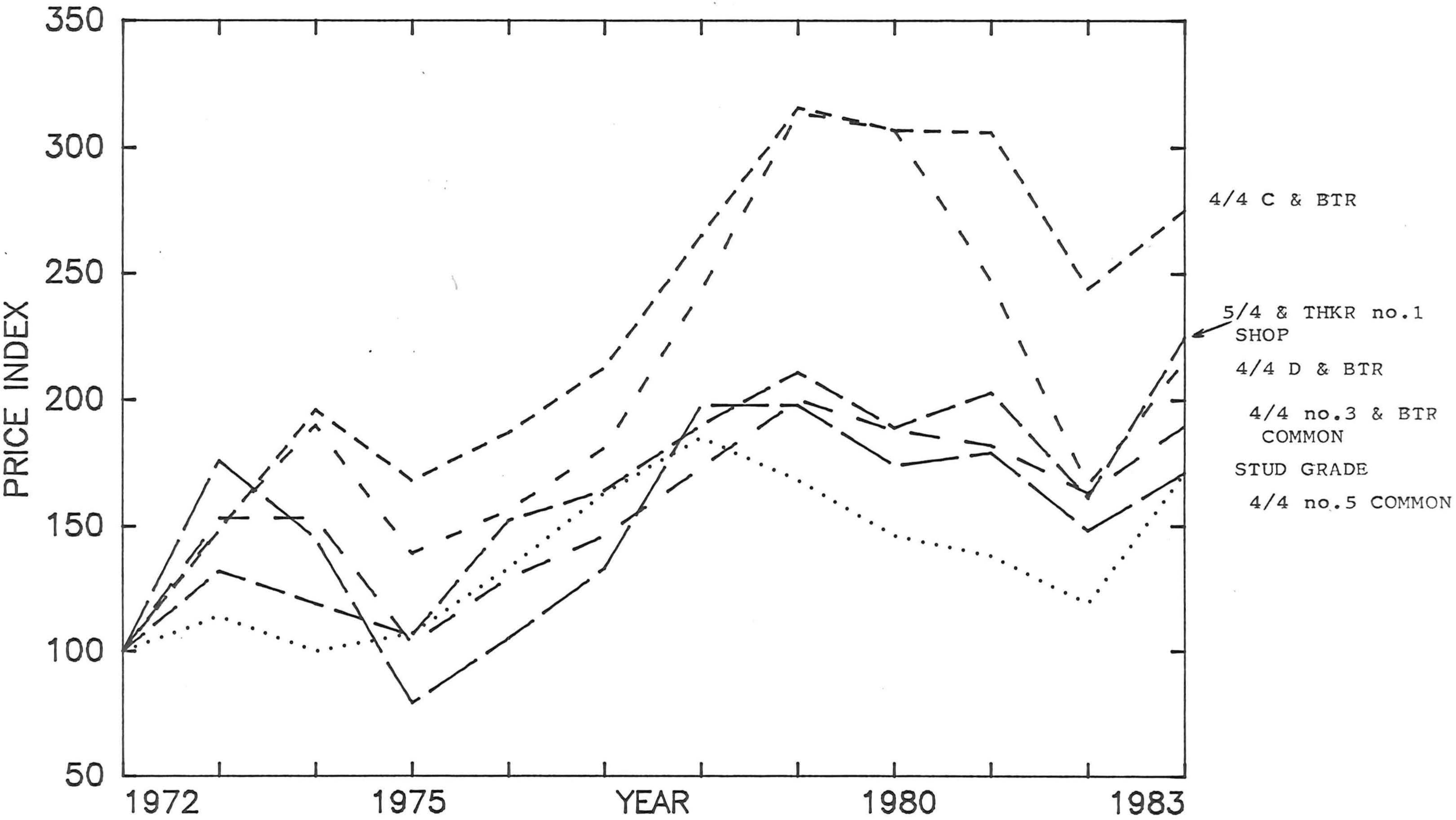


Figure: 8

Table 20: Ponderosa pine timber prices (US$/$m^3$)

Year	Select (1)	(2)	Shop (3)	Boards (4)	(5)	Dimension (6)
1972	160	109	103	47	21	50
1973	192	145	124	69	36	58
1974	247	202	129	53	28	45
1975	261	178	113	44	20	50
1976	289	172	165	64	25	61
1977	335	208	188	68	32	72
1978	408	277	219	92	45	88
1979	564	418	231	96	47	79
1980	484	237	229	91	38	70
1981	465	244	244	82	38	76
1982	476	296	182	66	34	60
1983	483	287	272	92	36	80

(1) 4/4 C α BTR 6"

(2) 4/4 D 6"

(3) 5/4 #1 SHOP

(4) 4/4 #3 COMMON 6"

(5) 4/4 #5 COMMON

(6) STUD GRADE

PONDEROSA PINE TIMBER PRICE INDEX (1972=100)

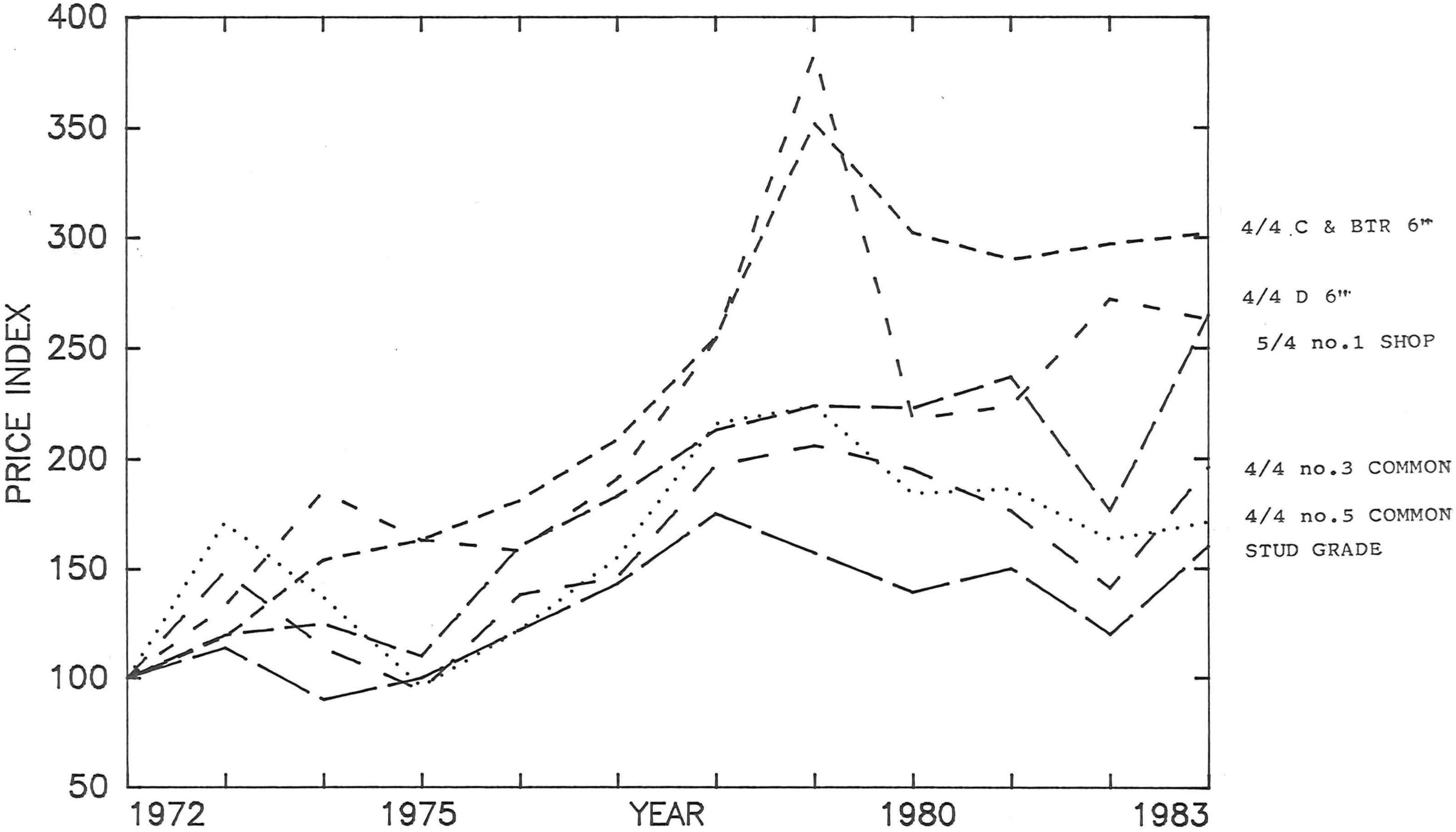


Figure: 9

Table 22: Hemlock/fir timber prices (US$/$m^3$)

Year	Shop (1)	(2)	Boards (3)	(4)	Dimension (5)
1972	98	86	43	36	54
1973	130	113	65	55	71
1974	131	103	58	42	61
1975	116	92	44	31	56
1976	158	132	56	47	70
1977	176	144	60	49	83
1978	238	164	73	60	94
1979	280	180	87	67	108
1980	251	159	77	57	87
1981	256	172	79	57	81
1982	251	138	65	47	71
1983	289	188	75	60	85

(1) 5/4 MOULDING α BTR

(2) 5/4 α THKR #1 SHOP

(3) 4/4 #3 α BTR COMMON

(4) 4/4 #4 COMMON

(5) #2 α BTR 6"

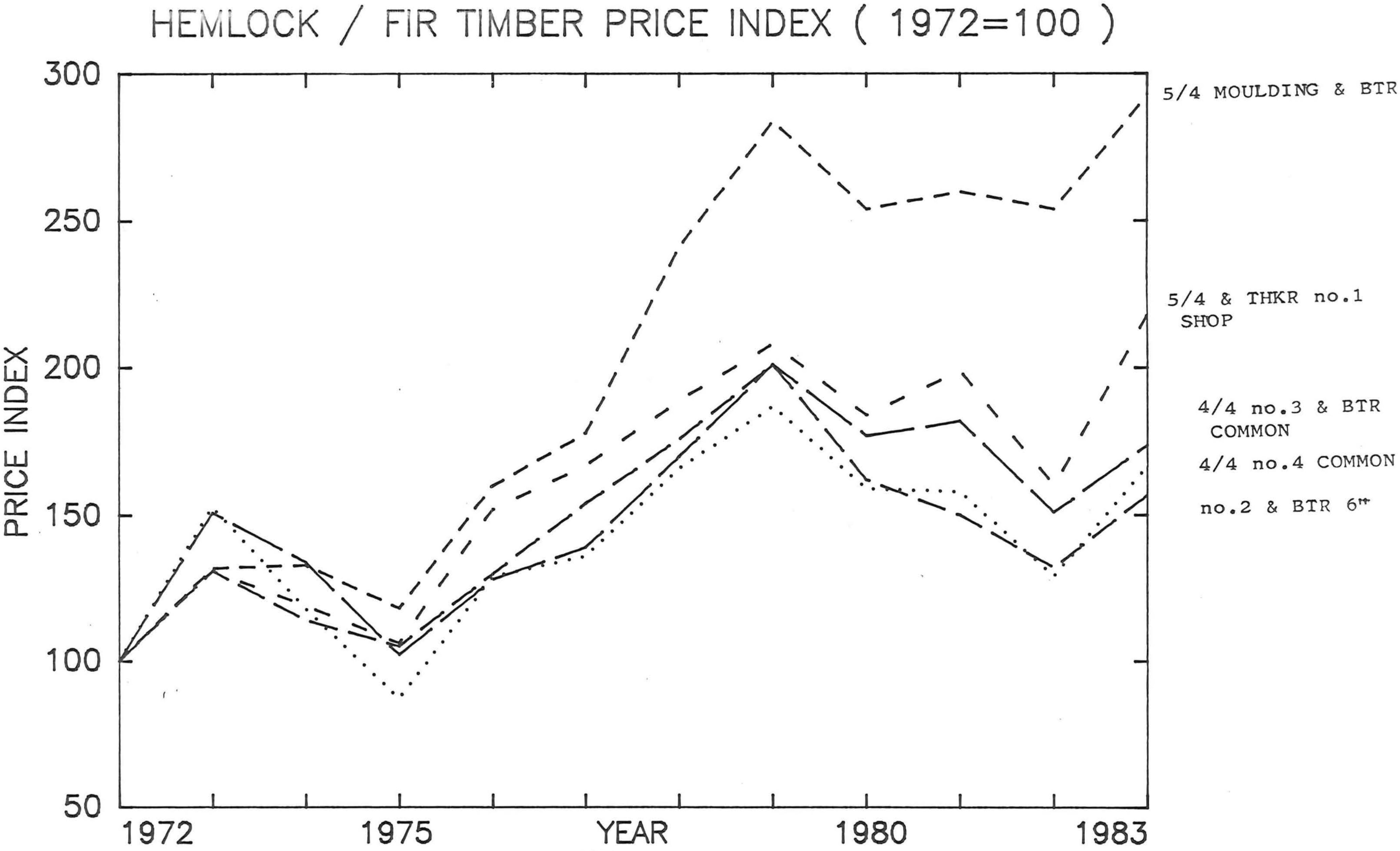

HEMLOCK / FIR TIMBER PRICE INDEX (1972=100)
PRICE INDEX
300
250
200
150
100
50
1972
1975
YEAR
1980
1983
5/4 MOULDING & BTR
5/4 & THKR no.1 SHOP
4/4 no.3 & BTR COMMON
4/4 no.4 COMMON
no.2 & BTR 6"

Figure: 10

Table 24: Southern pine timber prices (US$/$m^3$)

Year	Select (1)	Boards (2)	(3)	Dimension (4)
1972	85	53	46	65
1973	109	69	60	80
1974	117	57	49	60
1975	126	52	42	58
1976	138	75	63	80
1977	162	88	69	99
1978	205	110	83	102
1979	221	118	89	115
1980	220	107	77	99
1981	217	102	72	95
1982	214	107	72	96
1983	218	114	77	120

(1) 1 x 6 C α BTR

(2) 1 x 6 #2 α BTR RANDOM

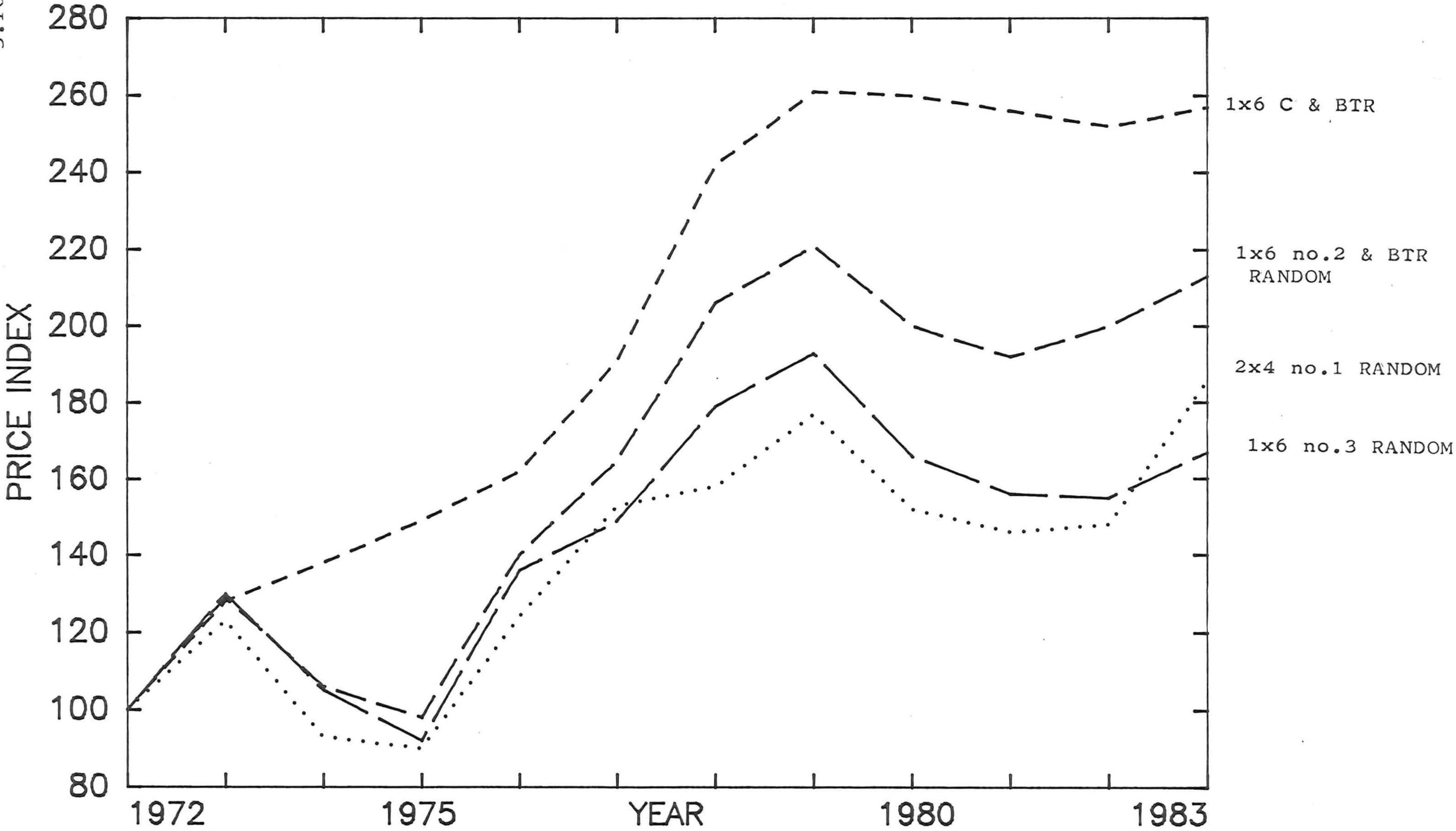
(3) 1 x 6 #3 RANDOM

(4) 2 x 4 #1 RANDOM

5.16

Figure: 11

SOUTHERN PINE TIMBER PRICE INDEX (1972=100)



Timber prices to Japan cut

From BRUCE ROSCOE in Tokyo

New Zealand log and sawn timber negotiators took price cuts in negotiations earlier this month in Tokyo, though volumes will stay unchanged from the previous low level, according to Japanese traders.

N.Z. Forest Products and the Forest Service were negotiating this year's fourth-quarter sales to a four-company Japanese buying cartel.

The new landed price for flitches was set at about 36,000 yen ($300) per cubic metre, and for sawn timber, 38,000 yen ($316), both prices about 1000 yen ($8.30) down on the third-quarter level.

Hiroshima sawmillers process flitches into export packaging timber.

At a Japan-New Zealand Timber Association meeting in Hiroshima to discuss the negotiation results, the association's chairman, Mr Sajuro Tachikawa, said Chilean pine was still threatening New Zealand radiata sales.

Mr Tachikawa predicted that New Zealand's log and timber shipments this year would reach only about 500,000 square metres while the volume from Chile would soon grow to 400,000 square metres a year.

The association is sending a team of sawmillers to Chile to inspect radiata plantings — all begun from seedlings imported from New Zealand — from November 9 to 20.

For fourth-quarter shipments, Japanese buyers will pay 6300 yen ($52.50) per 100 HKF (about 0.3 metres) for top-grade Mount Maunganui radiata logs, 6100 yen ($50.80) for grade-B logs, and 5100 yen ($42.50) for Nelson and other South Island logs.

According to Japan's financial daily Nihon Keizai Shimbun, Chilean pine within a few years is set to overtake New Zealand radiata to become the fourth most used imported timber, after South Seas, United States and Canadian timber.

The newspaper said Chile exported 278,000 cubic metres of pine to Japan last year, which was 2.6 times the volume sold the year before and forecast that shipments this year would surpass the 1983 volume.

Source:The Press 4th October 1984

source:The Press 1st September 1983

N.Z. timber is losing edge in Japan

From BRUCE ROSCOE in Tokyo

More Japanese timber dealers are turning to Chilean pine as New Zealand timber loses its competitiveness on the Japanese market.

Six firms have dropped out of the New Zealand Timber Importers Association, formerly comprising 25 dealers. In the last year three have gone out of the timber business, and three have switched to lower priced timber from Chile and North America.

The association, at its 15th directors' meeting held earlier this month at Hiroshima, reviewed timber price trends of suppliers other than New Zealand and concluded that New Zealand timber was pegged at unreasonably high prices.

The "Nikkan Mokuzai Shimbun" (daily timber newspaper) said the directors held little fear of a shortfall of Chilean pine and timber from other alternative suppliers.

Association members were warned at the meeting that they would face difficulties for the rest of the year in coping with the pressure of New Zealand's rising production costs, the newspaper said.

Some members had avoided tough trading by using North American timber. Others were relying on Chilean pine in the face of both high prices and a shortage of New Zealand timber.

The newspaper said that, depending on movements later this month of New Zealand and competitive suppliers' prices, members may need to act to bring New Zealand prices down, strongly suggesting that otherwise more use of other suppliers' timber is inevitable to stay solvent.

Table: 26

APPARENT SUPPLY OF SAWNWOOD - AUSTRALIA

Classification	Dec. quarter 1982r	March quarter 1983r	June quarter 1983r	Sept. quarter 1983	Dec. quarter 1983	Year ended 31 Dec. 1983
	m^3	m^3	m^3	m^3	m^3	m^3
Production						
Plantation conifers	214 917	209 031	280 284	262 097	239 327	990 739
Native forest timbers	401 660	370 703	426 390	441 095	439 737	1677 925
Imports						
Coniferous						
Undressed	87 638	93 264	204 279	173 360	120 243	591 146
Dressed	28 856	23 963	29 985	32 350	36 291	122 589
Broadleaved						
Undressed	36 459	28 243	38 525	45 964	54 681	167 413
Dressed	8 972	9 262	10 028	10 902	14 630	44 822
Boxboards (b)	-	28	84	-	-	112
Logs (sawn equiv)(b)	360	133	221	61	96	511
less exports						
Coniferous						
Undressed	383	-	686	1 117	547	2 350
Dressed	3	76	54	130	34	294
Broadleaved						
Undressed	9 281	6 004	8 953	5 489	8 775	29 221
Dressed	89	99	34	20	-	153
Boxboards (b)	-	-	-	-	-	-
Logs (sawn equiv)(b)	112	80	194	194	895	1 363
Apparent supply	768 994	728 368	979 875	958 879	894 754	3561 876

(a) Excluding railway sleepers. (b) The apparent consumption of sawnwood in Australia includes imports and exports of boxboards and the sawn equivalent of logs. In the calculation of apparent consumption in each State the volume of boxboards and logs traded has been excluded due mainly to confidentiality.

Sources: Australian Bureau of Statistics and the State and Territory Forest Services, and Forestry Economic Research Section of BAE.

Table: 27

IMPORTS CLASSIFIED BY COUNTRY OF ORIGIN - AUSTRALIA

Classification	Dec. quarter 1982r	March quarter 1983r	June quarter 1983r	Sept. quarter 1983	Dec. quarter 1983	Year ended 31 Dec. 1983
	m^3	m^3	m^3	m^3	m^3	m^3
SAWNWOOD						
North America						
Canada	36 296	32 330	60 759	65 444	36 717	195 250
USA	44 150	52 274	126 593	85 286	57 994	322 147
Subtotal	80 446	84 604	187 352	150 730	94 711	517 397
Europe						
Denmark	103	38	-	15	13	66
Finland	778	442	895	1 004	1 362	3 703
Germany, F.R.	8	21	-	-	3	24
Italy	-	-	-	-	1	1
Netherlands	2	6	-	-	-	6
Sweden	278	234	339	158	260	991
UK	31	32	61	116	35	244
Other European	3	-	-	37	-	37
Subtotal	1 203	773	1 295	1 330	1 674	5 072
South America						
Bolivia	-	18	-	-	-	18
Brazil	250	292	164	233	151	840
Chile	-	-	68	-	-	68
Ecuador	28	56	31	164	107	358
Paraguay	-	-	-	16	-	16
Peru	38	-	-	-	-	-
Subtotal	316	366	263	413	258	1 300
Africa						
Ivory Coast	25	9	-	99	63	171
Sth Africa	-	14	-	-	-	14
Subtotal	25	23	-	99	63	185
Asia						
Burma	20	-	37	44	30	111
Hong Kong	142	106	149	181	106	542
Indonesia	977	1 159	748	1 773	1 084	4 764
Japan	36	41	13	-	47	101
Malaysia	28 816	26 208	27 896	35 354	48 252	137 710
Philippines	8 161	3 890	11 413	9 826	12 342	37 471
Singapore	2 411	3 897	4 494	5 005	4 614	18 010
Taiwan	86	24	50	203	264	541
Thailand	-	19	-	4	2	25
Subtotal	40 649	35 344	44 800	52 390	66 741	199 275
Pacific region						
Fiji	170	14	102	53	136	305
New Caledonia	-	25	-	1	-	26
New Zealand	35 814	32 054	46 039	54 506	59 600	192 199
Papua New Guinea	2 653	1 191	2 426	2 216	2 050	7 883
Solomon Is.	585	338	536	838	612	2 324
Vanuatu	24	-	-	-	-	-
Western Samoa	-	-	4	-	-	4
Subtotal	39 286	33 622	49 107	57 614	62 398	202 741
TOTAL SAWNWOOD	161 925	154 732	282 817	262 576	225 845	925 970
BOX BOARDS	-	28	84	-	-	112
LOGS (sawn equiv.)(a)						
Canada	-	-	86	44	92	222
Malaysia	-	27	1	-	1	29
New Zealand	-	-	73	-	1	74
Papua New Guinea	67	-	2	-	1	3
Solomon Is.	144	35	58	16	-	109
UK	-	-	-	-	1	1
USA	149	71	1	1	-	73
TOTAL LOGS	360	133	221	61	96	511
TOTAL IMPORTS	162 285	154 893	283 122	262 637	225 941	926 593

(a) Estimated sawn recovery from log imports.

Source: Australian Bureau of Statistics.

Table: 28

UNIT VALUE OF SAWNWOOD IMPORTS (a) - AUSTRALIA: BY SPECIES

Classification	Sept. quarter 1982	Dec. quarter 1982	March quarter 1983	June quarter 1983	Sept. quarter 1983	Dec. quarter 1983
	$/m^3	$/m^3	$/m^3	$/m^3	$/m^3	$/m^3
UNDRESSED						
Douglas fir	146.74	135.44	128.66	158.00	160.41	149.77
Hemlock	104.57	104.01	105.97	137.43	132.85	136.60
Radiata	145.17	160.24	156.32	159.40	160.13	186.31
Redwood	360.65	211.64	415.65	431.59	-	-
Western red cedar	271.65	309.82	268.80	301.62	313.86	328.52
Other conifers	316.15	410.49	209.04	254.63	333.41	289.29
Balsa	-	-	-	-	313.25	-
Beech	424.80	417.87	405.38	316.00	329.29	370.54
Kapur	154.56	150.64	192.27	266.83	217.35	198.88
Keruing	154.96	131.97	171.06	215.43	176.46	183.85
Meranti	218.97	230.49	226.01	234.13	256.57	243.80
Merbau	218.90	233.49	222.05	253.51	272.01	261.96
Nyatoh	190.57	207.62	200.01	264.07	224.33	217.16
Philippine mahogany	226.54	201.23	194.37	226.77	236.39	238.56
Ramin	293.45	290.48	289.22	334.25	337.64	299.04
Teak	791.20	734.51	722.83	926.66	894.34	866.80
Other broadleaved	219.99	204.02	248.07	271.29	246.91	232.17
DRESSED						
Douglas fir	145.05	167.60	162.90	173.02	192.35	190.43
Radiata	216.64	232.61	222.01	251.90	245.45	244.71
Other conifers						
Weatherboard	289.11	282.48	303.87	356.30	306.03	290.13
Other	140.36	221.19	186.61	260.07	277.04	265.35
Mahogany	342.88	344.09	311.73	363.76	350.38	363.70
Meranti	362.10	375.80	387.89	428.32	417.03	390.19
Other broadleaved						
Flooring	218.84	-	396.76	321.81	-	294.50
Other	278.52	192.94	287.24	303.89	298.57	298.58
UNDRESSED						
Coniferous	13 998	14 675	36 286	32 142	22 247	105 350
Broadleaved	8 463	6 617	9 993	11 867	13 375	41 852
TOTAL UNDRESSED	22 461	21 292	46 279	44 009	35 622	147 202
DRESSED						
Coniferous	5 933	5 126	7 484	7 731	8 760	29 101
Broadleaved	3 267	3 209	3 826	4 007	5 347	16 389
TOTAL DRESSED	9 200	8 335	11 310	11 738	14 107	45 490
BOXBOARDS	-	8	17	-	-	25
LOGS	102	21	49	13	24	107
TOTAL IMPORTS	31 763	29 656	57 655	55 760	49 753	192 824

(a) Value for duty.

Source: Australian Bureau of Statistics

Table 29: USA imports of sawlogs and sawn timber (000 m^3)

Year	Saw and Veneer logs	Sawn timber
1975	310	13314
1976	305	17712
1977	636	24213
1978	358	27504
1979	536	25797
1980	517	22169
1981	397	21334
1982	447	21188

NOTES: Canada is the country of origin for almost all of the USA's imports of sawlogs and sawn timber.

Source: FAO, 1977 to 1984.

Table 30: USA exports of sawn timber by country of destination (000 m^3)

Year	Canada	Japan	Europe	Middle East	Latin America	Aust-ralia	Others	Total
1975	1402	1086	406	1	-	254	-	3149
1976	1048	1076	685	3	-	349	-	3161
1977	853	1030	582	77	322	252	343	3459
1978	836	901	511	14	325	238	351	3176
1979	910	1510	769	72	430	220	179	4090
1980	860	1496	909	188	739	213	180	4647
1981	1172	1195	486	188	825	289	322	4477
1982	601	1441	498	119	680	242	237	3818

Source: FAO, 1977 to 1984

Table 31: USA exports by sawlogs and veneer logs by country of destination (000 m^3)

Year	Japan	Canada	Europe	Korean Rep	China	Others	Total
1975	9297	1417	2	448	-	-	11164
1976	10021	1720	4	732	-	-	12477
1977	11116	1421	16	917	-	30	13500
1978	11960	1473	4	1454	-	51	14942
1979	14228	1615	8	1170	-	49	17070
1980	11473	1239	8	906	398	59	14084
1981	8012	947	5	678	1007	119	10768
1982	8938	1236	5	1251	2478	203	14111

Source: FAO, 1977 to 1984

Table 32: Projection of future softwood timber imports and exports and softwood log exports of the USA (000 m^3)

Year	Timber Imports	Timber Exports	Log exports
1990	62000	8400	14000
2000	57000	8400	11000
2010	57000	8400	11000
2020	54000	5700	11000
2030	51000	5700	8400

Source: USDA, 1982.

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MEDIUM DENSITY FIBREBOARD

Quality mouldings with fine finished edges that won't warp, chip, split or shrink

* CUSTOMWOOD IS A TRADE NAME OF CANTERBURY TIMBER PRODUCTS LTD

Customwood™ Mouldings

MEDIUM DENSITY FIBREBOARD

Customwood Mouldings won't warp, chip, split or shrink. There's no routing, edging or sandpapering to be done. Simply pick them up and stick them up.

Their smooth, hard surface enables paint to flow on effortlessly, giving an attractive finish to doors, walls and windows. Customwood™ Mouldings are a cost competitive versatile alternative to all other types of architraves, skirtings and cornices.

They are made from superior wood fibre and strengthened with a tough sealing resin. Their even density distribution enables full use of sanded edges.

General Information

Fixing Customwood™ Mouldings

The fine finished edges and even density of Customwood™ Mouldings ensures easier fixing onto walls, doors and windows.

Standard techniques can be used, with the following hints helping you achieve a first class result.

Nailing

a) When nailing, 40mm to 50mm finishing brads are recommended.
b) Ensure fixing is to a minimum depth of 25mm into the framing timber.
c) Punch the nails and fill with a stopping compound to maintain the smooth surface.
d) If it is necessary to nail through the side rather than the face, this should be done at least 25mm from the edge or corner of the moulding.

Adhesives

Modern building practice has seen a move towards adhesives. Customwood™ Mouldings perform well when fixed in this manner.

a) Use the adhesive in accordance with manufacturer's instructions.
b) All reputable brands of contact, stud and wallboard type adhesives can be used.

Recommended manufacturers include Ados, Bostik, Davis, Selleys and Expandite.

Stapling

a) Narrow crown staples are recommended when fixing the mouldings.
b) Best results are obtained with the use of Sencoted N4450 staples.
c) The staple length should give fixing into the timber frame of at least the thickness of the moulding.

Screwing

a) If screwing on the face of the moulding pilot holes are recommended.
b) If screwing in side, follow same instructions for nailing.
c) Countersink the screws and fill with a stopping compound.

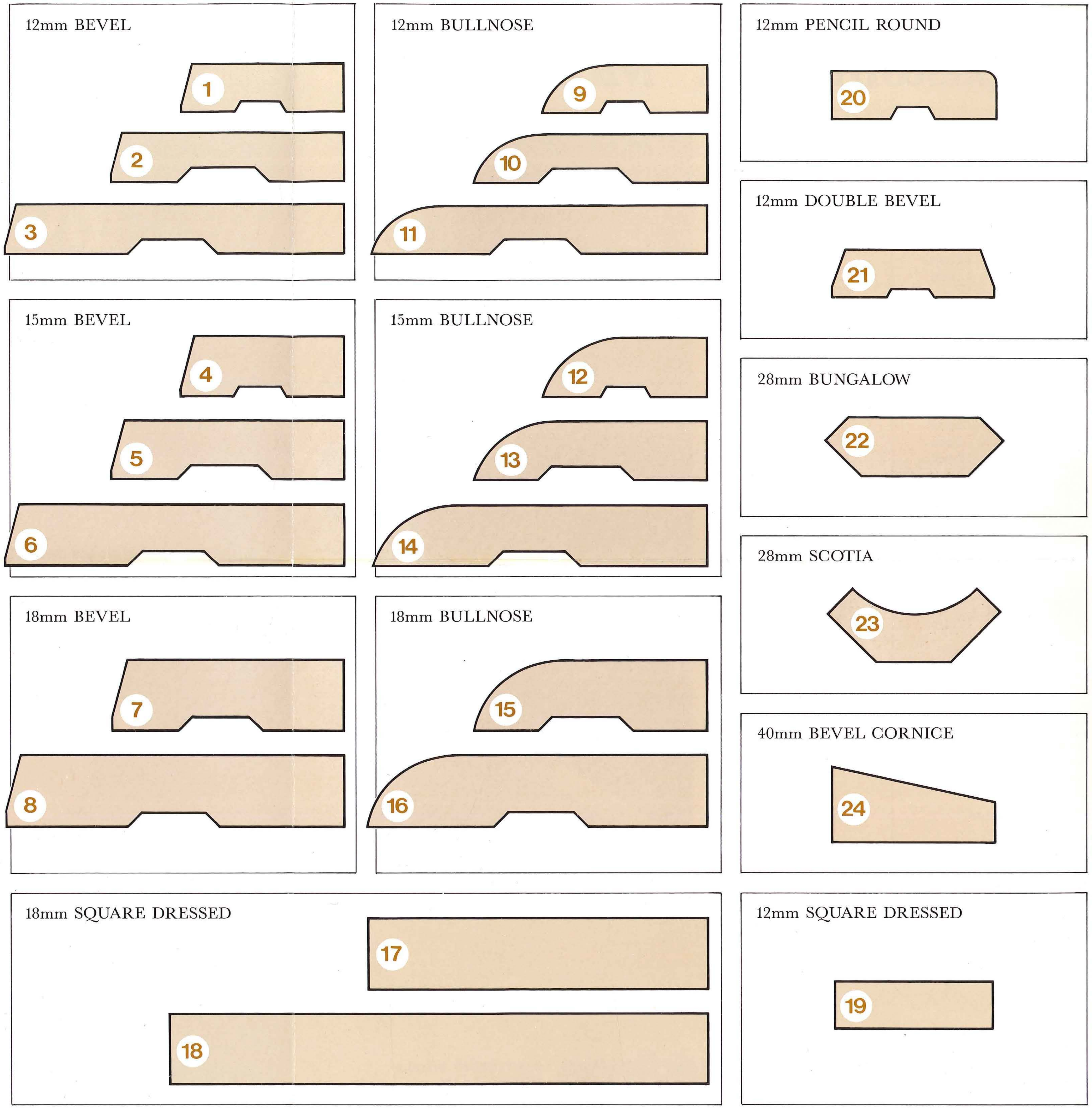
Finishing Customwood™ Mouldings

Painting

a) The first undercoat is critical to a good finish. For best results use a solvent based paint and do not thin for the first coat.
b) Lightly sand after the first coat.
c) A second undercoat is recommended for gloss finishes.
d) Any standard finishing system, whether oil based or acrylic, can be applied for the final coat. Use in accordance with the manufacturer's instructions.

Clear Finishing

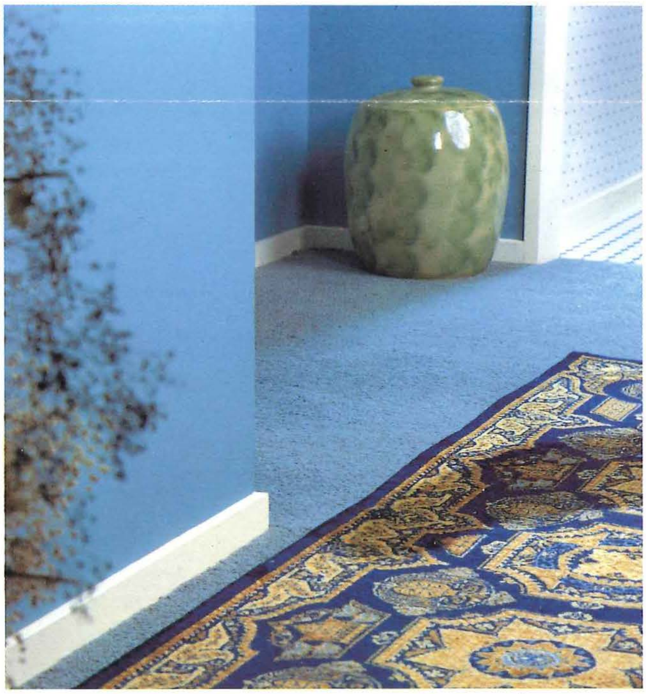
a) Where Customwood™ Mouldings are to be clear finished or stained, care should be taken to colour match the stopping compound. DAP wood dough is recommended.
b) Apply the sealer first. Resene PB sealer is recommended as a base for most commonly available polyurethane systems.
c) Apply final coat in accordance with the manufacturer's instructions.



Customwood™ Mouldings

STANDARD AND STOCK SIZES

	CODE NO.	PIECES PER PACK
BEVEL		
4.800 x 40 x 12mm	1	26
4.800 x 60 x 12mm	2	25
4.800 x 85 x 12mm	3	25
4.800 x 40 x 15mm	4	21
4.800 x 60 x 15mm	5	21
4.800 x 85 x 15mm	6	22
4.800 x 60 x 18mm	7	17
4.800 x 85 x 18mm	8	19
BULL NOSE		
4.800 x 40 x 12mm	9	26
4.800 x 60 x 12mm	10	25
4.800 x 85 x 12mm	11	25
4.800 x 40 x 15mm	12	21
4.800 x 60 x 15mm	13	21
4.800 x 85 x 15mm	14	22
4.800 x 60 x 18mm	15	17
4.800 x 85 x 18mm	16	19
SQUARE DRESSED		
3.600 x 85 x 18mm	17	19
3.600 x 135 x 18mm	18	19
4.800 x 40 x 12mm	19	25
PENCIL ROUND		
4.800 x 40 x 12mm	20	25
DOUBLE BEVEL		
4.800 x 40 x 12mm	21	25
BUNGALOW		
4.800 x 28mm	22	25
SCOTIA		
4.800 x 28mm	23	25
BEVELLED CORNICE		
4.800 x 40mm	24	24



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Phone 694-775

South Island P.O. Box 154
Rangiora Phone 6819